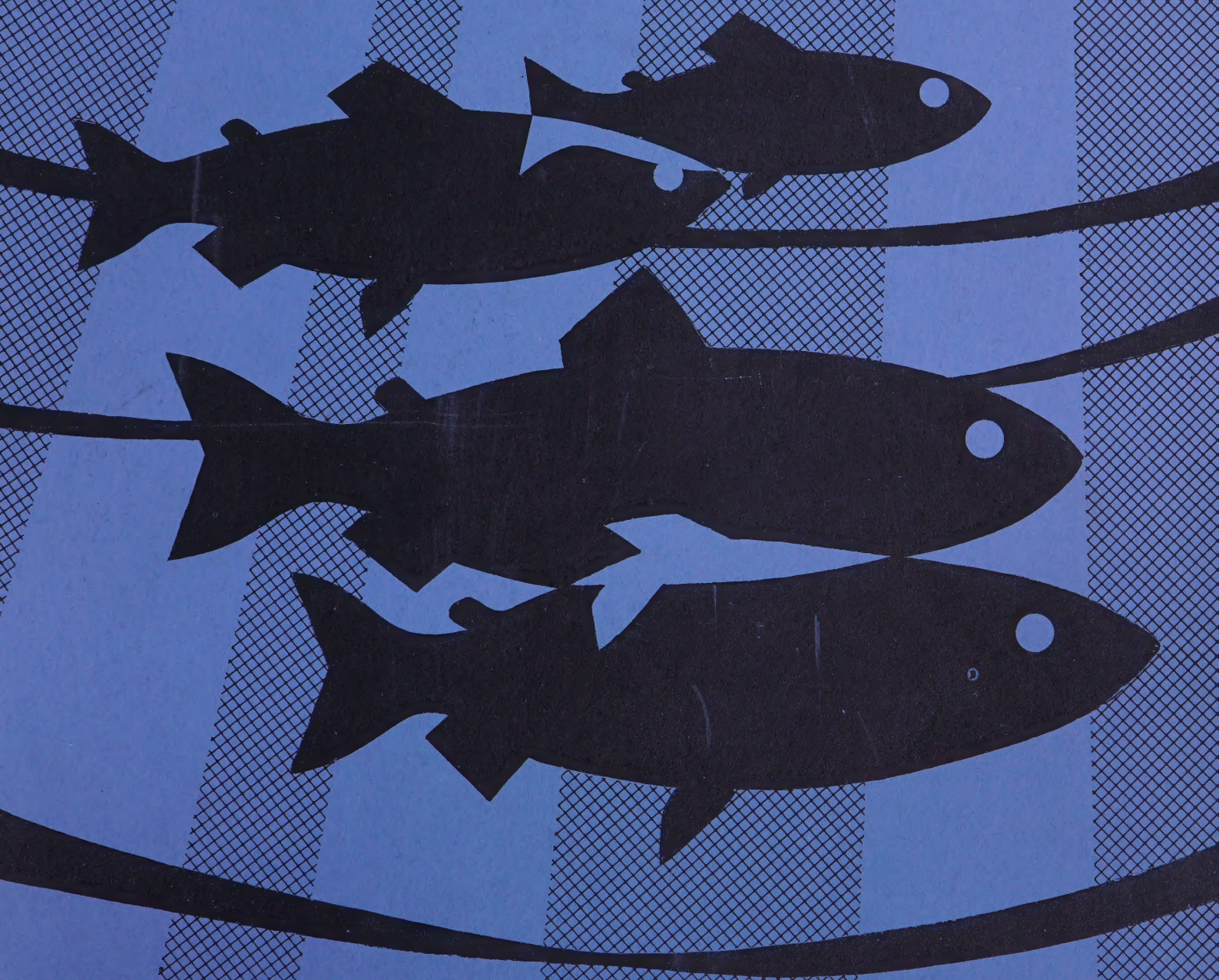
Preliminary Biological Survey of Six Lakes in Northern Alberta

by G. M. Bradley



Survey Report No. 15

Alberta Fish and Wildlife Division
FISHERIES SECTION

PRELIMINARY BIOLOGICAL SURVEY OF SIX LAKES IN NORTHERN ALBERTA 1969

by
G.M. Bradley

Fish and Wildlife Division

Department of Lands and Forests

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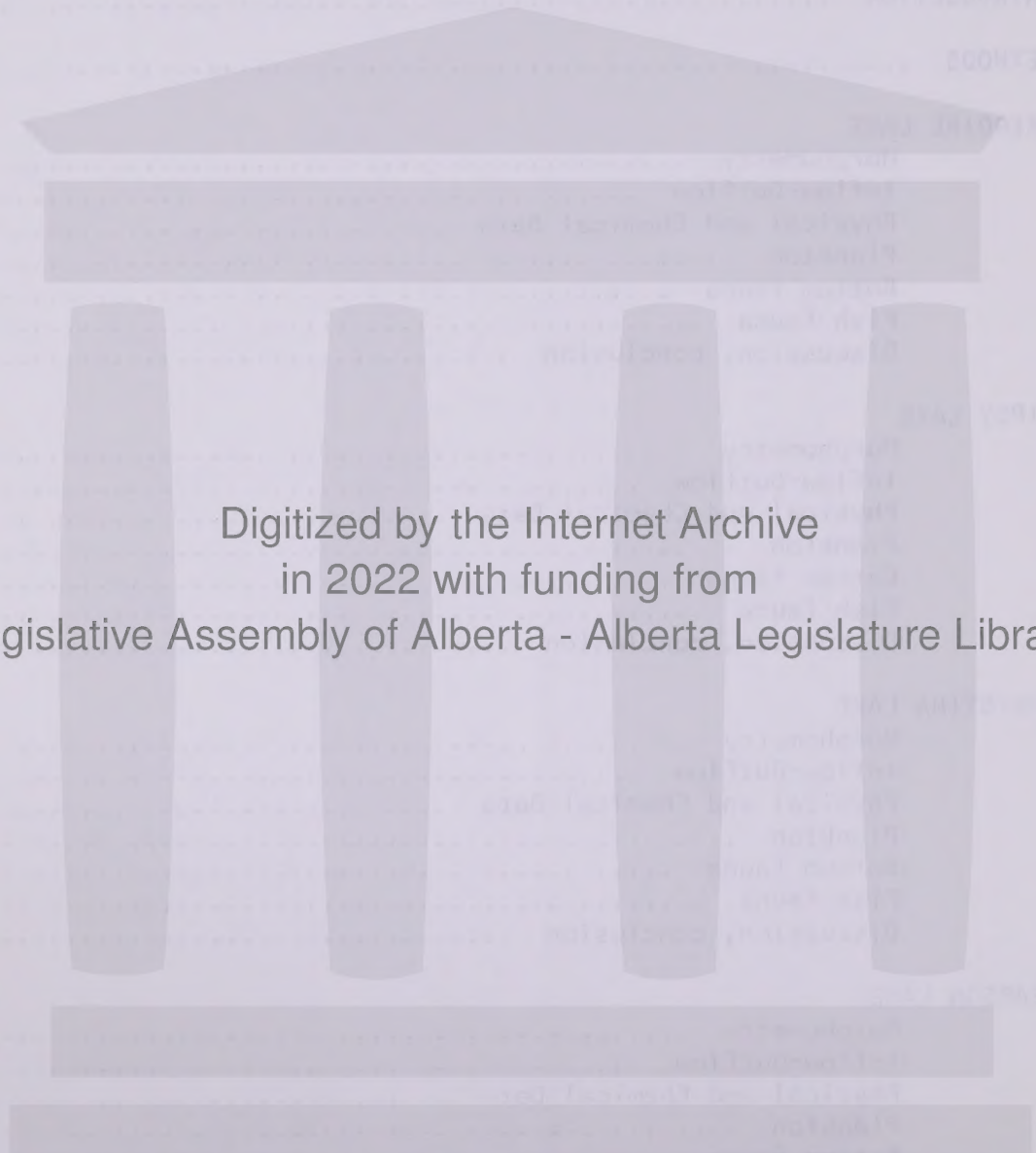

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INTRODUCTION

Six lakes in Northern Alberta were surveyed during the summer of 1969 to assess their fishery potential. These lakes are located in three different areas of the province as indicated in Figure A. The lakes are Gregoire, Gipsy, Christina, Pearson, Chipewyan and Burnt. Many other lakes were examined and these are listed in the Appendix. The results from the 1969 survey are presented in this report.

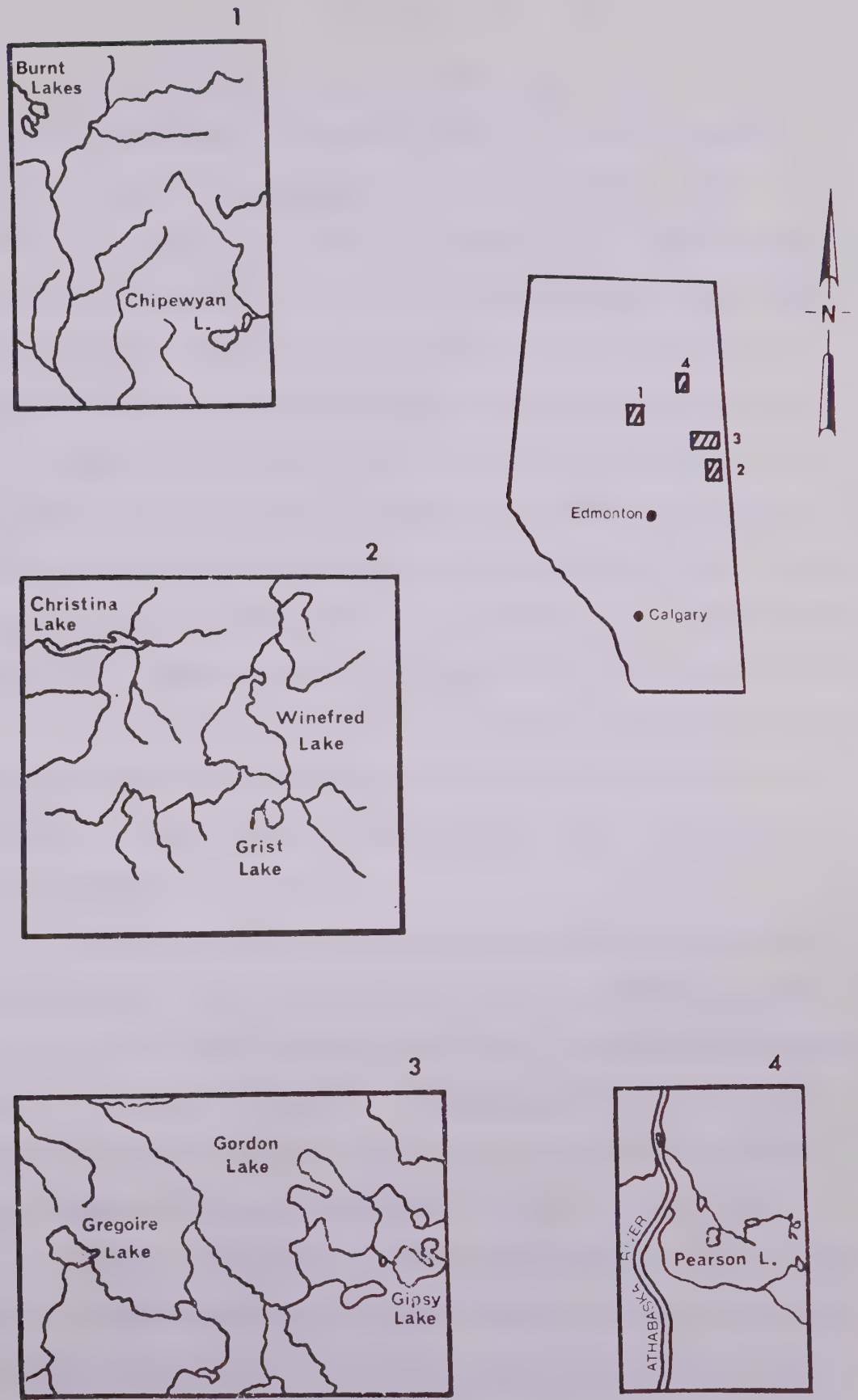


Figure A. Map showing the six lakes of the survey and their associated drainage systems.

(Scale: 1 in. = 16 mi.)

METHODS

The lake surveys done during 1969 were conducted on a fly-in basis and the techniques used were adapted to suit this situation. A collapsible rubber boat equipped with a 9.5 hp outboard motor was used for sounding, dredging, and netting operations. The soundings were taken with a Furuno FG 200 echo sounder and the data obtained was plotted on a large scale map of the lake. Areas were then determined with a planimeter and the shoreline was measured by using a mileage wheel.

Bottom samples were taken with a 6" x 6" Ekman dredge. The samples were strained through a screen bottom bucket (25 meshes per inch) and the residue was then washed into a labelled plastic bag. At camp, the bag contents were emptied into a tray and all the living organisms were picked out and preserved in 10% formalin for later identification.

A Hellige comparator was used to determine the pH of the water samples, while the other chemical data was obtained by using a Hach D.R.E.L. kit. Total dissolved solids readings were taken with a conductivity meter.

Plankton was collected by taking a 20 foot vertical haul at the limnology station. For this purpose, a Wisconsin plankton net with a mouth diameter of 20 cms and #20 mesh silk was used. Plankton samples were preserved in 2 percent formalin. An approximate displacement volume was calculated for each sample by removing a 40 ml aliquot from a well stirred sample and centrifuging it for 20 minutes at 2,000 rpm.

A record was kept of all fish netted, showing the mesh size, the depth and location of the net set. Ideally, a 30 fish sample of each species was to be examined, however, due to problems of time

and weather, this was not always possible. When the fish were worked, lengths, weights, and sexual maturity were recorded. As well, scale samples (or otoliths) were obtained for age determination at a later date.

Cyst counts for plerocercoids of Triaenophorus crassus were carried out on whitefish and cisco while they were being worked.

GREGOIRE LAKE

Gregoire Lake is located about 20 miles south-southeast of Fort McMurray in Township 86, Ranges 7 and 8, west of the fourth meridian (approximately 66° 30' N latitude and 111° 5' W longitude) (Fig. A). The lake is at an altitude of 1,559 feet m.s.l. and is drained by the Gregoire River, a tributary of the Athabasca River. The lake was surveyed during the period 17-22 May, 1969 and is accessible by road.

The lake is located in a gently sloping basin. The sides of these slopes are covered by deciduous forest consisting mainly of poplar with some birch.

Commercial fishing records indicate that this lake has been fished sporadically in the past with decreasing success (Table XI).

Morphometry

Gregoire Lake has a surface area of 13.08 square miles (8,371 acres) a shoreline length of 20 miles and shoreline development factor of 1.56. The maximum effective length of the lake is 5.25 miles in a northwest-southeast direction parallel to the direction of the prevailing summer winds and the maximum effective width is 1.04 miles.

Depths were taken with a Furuno echo sounder and the results were used to plot a bottom contour map (Fig. 1). From this data, a volume of 116,208 acre feet was calculated giving a mean depth of 13.9 feet. The maximum depth recorded was 25 feet.

The shoreline of the lake is composed mainly of rubble and gravel with the exception of three large sandy beaches. Both emergent and submergent aquatic vegetation were abundant around the shoreline

and in the bay at the east end.

Inflow-Outflow

The only stream with sports fisheries potential entering Gregoire Lake is Surmont Creek. The stream has a good gravel bottom and a favorable pool to riffle ratio. In several places roads have been bulldozed across the stream causing some downstream siltation. The stream varies in width from 6 to 12 feet and appears to have stable banks. Tremendous numbers of fish eggs were observed floating downstream and several schools of white suckers were observed. Personal communications with Al Needham, a local forest ranger, indicate that the stream supports a population of Arctic grayling although none were collected in the survey. Water chemistry is shown in Table XII.

The Gregoire River is the only outlet of Gregoire Lake. It flows into the Christina River and in part of the Athabasca River drainage. The survey of the river was hampered by high water conditions and flooding of the surrounding terrain. The river was 20 to 30 feet wide with depths estimated at 5 feet or greater. Needham indicated that in the late summer and fall the river becomes considerably smaller, having a width of only 6 to 10 feet and a depth of less than 1 foot. Again, large numbers of fish eggs were observed. High water made fish collection impossible. The water chemistry is shown in Table XII.

Physical and Chemical Data

A single limnology station was set up 22 May, 1969. The air temperature was 14°C. The sky was clear and there was a light wind at this time. The Secchi disc reading was 5 feet. The temperature was

10.6°C at the surface and 9.6°C at 23 feet. The pH was 7.8 at the surface and 7.6 at the bottom. The total dissolved solids was 95 ppm at the surface and 96 ppm at the bottom.

These results indicate that the lake was in spring overturn and no thermocline had yet been established.

Plankton

One plankton haul of 23 feet was taken at the limnology station. This sample revealed a bloom of phytoplankton with Microcystis and Nostoc (blue-green algae) being dominant. The green algae Pediastrum, Scenedesmus, Staurastrum; the diatom Fragilaria; the blue-green algae Anabaena; and the dinoflagellate Ceratium were all common. The diatoms Asterionella and Stephanodiscus were present only in trace amounts.

Zooplankton made up a considerably smaller portion of the sample than did phytoplankton. Cladocerans, copepods, and rotifers were fairly abundant with lesser numbers of ostrocods also being present (Table III).

Bottom fauna

A total of 34 bottom samples were taken, each consisting of a single dredge sample from each location. The samples indicated that most of the deeper lake bottom (15 feet or greater) consists of brown mud, with sand being dominant in shallower areas (10 feet or less). The standing crop of bottom fauna is estimated to be 3,154 organisms per square meter, with a volume displacement of 45.5 cc per square meter.

In both numbers and volume, chironomids were the dominant organisms. Other groups found in the sample are shown in Table IV.

Fish fauna

Six 12-hour net sets were made during the survey at the locations shown in Figure 2. The mesh sizes, net lengths, and catch record are shown in Table V. Six species of fish were netted: lake whitefish (Coregonus clupeaformis), cisco (Coregonus artedii), northern pike (Esox lucius), walleye (Stizostedion vitreum), yellow perch (Perca flavescens), longnose suckers (Catostomus catostomus), and burbot (Lota lota). Several seine hauls were made and spottail shiners (Notropis hudsonius), and yellow perch were collected.

Lake whitefish

Eighteen lake whitefish were netted and worked (Table VIII). The fish taken were 6 years of age or older and all were mature. Eleven of 16 fish examined were found to be infected with cysts of Triaenophorus crassus. In total, 59.2 pounds of fish were found to contain 44 cysts, producing an infestation rate of 74 cysts per 100 pounds of fish.

Cisco

Thirteen cisco were netted and worked (Table IX). These fish were quite small and mature at 3 to 4 years of age. Nine of 13 fish examined were found to be infected with cysts of Triaenophorus crassus. In total, 4.2 pounds of fish contained 41 cysts, giving an infestation rate of 976 cysts per 100 pounds.

Northern pike

A total of 57 northern pike were taken and of these 40 were worked (Table VI). These fish varied in age from 3 to 13 years and

appeared to mature between 4 and 5 years of age. The fish taken were not especially large with the heaviest individual weighing 7 pounds.

Walleye

Sixteen walleye were netted and worked (Table VII). These fish were of a moderate size and appeared to mature at 3 to 5 years of age, although this is based on a very small sample.

Other species

Five perch, three longnose suckers, and five burbot were also netted but not worked.

Discussion and Conclusion

Using the Ryder morpho-edaphic index, a productivity figure of approximately 3.7 pounds of fish per acre per year can be postulated for Gregoire Lake. This indicates that total annual fish production for this lake is approximately 30,000 pounds. Of this, 10,000 pounds would be piscivorous fish (mainly northern pike) and 20,000 pounds would be cisco, whitefish and suckers. Gregoire Lake is presently being used for domestic and recreational fishing. As previous catch records indicate (Table XI), there is little potential for a commercial fishery on this lake. Cisco and whitefish occur in limited numbers and walleye appear to have been almost eliminated. The lake is intensely used as a recreational area and is very heavily fished mainly by inhabitants of Fort McMurray. It is not uncommon to have 3 to 4 hundred people using the lake on a weekend. In view of this heavy fishing pressure and in order to maintain a future sports fishery in the lake, I would recommend

a closure on any commercial fisheries and that angling be prohibited in the outlet stream and its immediate lake area during the months of April and May.

TABLE 1. Morphometry of Gregoire Lake. (Soundings were taken with a Furuno sounder during May, 1969). Other data were taken from maps at a scale of one inch to three-quarters of a mile.

LOCATION: Tp. 86, Rges. 7 & 8, W. 4

AREA: 13.08 sq. mi. (8,371 acres)

VOLUME: 116,208 acre feet

SHORELINE: 20.03 miles

SHORELINE DEVELOPMENT FACTOR: 1.56

MAXIMUM LENGTH: 5.25 miles

MAXIMUM EFFECTIVE LENGTH: 5.25 miles

MAXIMUM WIDTH: 3.80 miles

MAXIMUM EFFECTIVE LENGTH: 3.80 miles

MEAN WIDTH: 2.49 miles

MAXIMUM DEPTH: 25 feet

MEAN DEPTH: 13.88 feet

DEPTH DISTRIBUTION:

Contour Interval	Acres	% Surface Area
0- 5 feet	953	11.4
5-10 feet	1,428	17.0
10-15 feet	1,574	18.8
15-20 feet	2,995	35.8
20-25 feet	1,261	15.1
25 feet plus	160	1.9
Total Surface Area	8,371	100.0%

TABLE II. Water chemistry, Gregoire Lake. Samples 1 and 2 were taken at the limnology station.

Sample No.	1	2
Date	22-V-69	22-V-69
Depth (feet)	surface	23
Temperature (^{o}C)	12	8.4
Dissolved oxygen (ppm)	9	9
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil
Total alkalinity (ppm $CaCO_3$)	50	55
Calcium hardness (ppm $CaCO_3$)	40	40
Total hardness (ppm $CaCO_3$)	50	50
pH	7.6	7.8
Total dissolved solids (ppm)	96	95

TABLE III. Plankton sample, Gregoire Lake, May, 1969.

Group	Relative Abundance*
A. Phytoplankton	
Chlorophyta	
Pediastrum sp.	4
Scenedesmus sp.	3
Staurastrum sp.	3
Chrysophyta	
Asterionella sp.	1
Fragilaria sp.	4
Stephanodiscus sp.	tr.
Cyanophyta	
Anabaena sp.	3
Microcystis sp.	blm.
Nostoc sp.	blm.
Pyrrophyta	
Ceratium sp.	4
B. Zooplankton	
Arthropoda	
Cladocerans	3
Copepods	3
Ostrocods	2
Rotifera	
Rotifers	3
Settled Volume of Sample (mls.)	0.51

* Relative Abundance Scale - trace, 1, 2, 3, 4, 5, bloom.

Total Vertical Haul (23')

TABLE IV. Bottom fauna analysis, Gregoire Lake. A total of 34 - ¼ sq. ft. dredgings were taken in May, 1969. The following figures are standardized to square meters.

Organisms	No./m^2	% Total No.	Volume/m^2 (mls)	% Total Volume
Chironomidae	2410	76.4	40	87.9
Ephemeroptera	39	1.2	1.1	2.4
Trichoptera	20	0.6	-	-
Amphipoda	207	6.6	1.0	2.2
Oligochaeta	134	4.2	-	-
Hirudinea	16	0.5	-	-
Pelecypoda	316	10.0	3.4	7.5
Gastropoda	10	0.3	-	-
Annelida	1	-	-	-
Hydracarina	1	-	-	-
TOTALS	3154	99.8	45.5	100.0

TABLE V. Summarized catch record for Gregoire Lake, May, 1969.

Date Set & Pulled	Set No.	Mesh Size	Set Length	Set Depth (ft.)	Perch	Lake Whitefish	Northern Pike	Walleye	Tullibee	Burbot	Longnose Sucker	Total
17-18-V-69	1	1½	50 yds	12	5	0	2	0	3	0	0	10
17-18-V-69	1	3½	50 yds	13	0	0	14	2	1	0	0	17
17-18-V-69	1	5½	50 yds	14	0	1	1	2	0	0	0	4
17-18-V-69	2	2½	50 yds	18	0	0	5	1	3	0	0	9
17-18-V-69	2	4½	50 yds	25	0	1	4	1	0	0	0	6
19-20-V-69	3	4½	50 yds	5	0	5	4	6	0	0	0	15
19-20-V-69	3	2½	50 yds	10	0	0	13	3	1	0	0	17
21-22-V-69	4	4½	50 yds	16	0	3	2	0	0	0	1	6
21-22-V-69	4	2½	50 yds	18	0	0	10	0	7	0	0	17
21-22-V-69	5	5½	50 yds	21	0	8	1	0	0	5	0	14
22-22-V-69	6	5½	50 yds	12	0	1	0	0	0	0	0	1
22-22-V-69	6	4½	50 yds	14	0	0	1	0	0	0	2	3
TOTALS					5	15	57	15	15	5	3	119

TABLE VI. Northern pike from Gregoire Lake, May, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
IV	3	7.5	537 (520-559)	977 (910-1110)	33
V	17	42.5	580 (510-656)	1313 (980-1710)	25
VI	12	30	600 (548-682)	1502 (1140-2180)	58
VII	3	7.5	595 (560-648)	1460 (1220-1760)	33
VIII	2	5	683 (666-700)	2125 (1910-2340)	100
IX	1	2.5	730	2520	100
X	1	2.5	786	3250	100
XIII	1	2.5	774	3050	100

TABLE VII. Walleye from Gregoire Lake, May, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	1	6	432	900	0
V	2	12.5	482 (459-505)	1260 (1090-1430)	0
VI	6	37.5	484 (447-520)	1338 (1070-1620)	50
VII	5	31	498 (454-526)	1278 (1000-2000)	40
VIII	2	12.5	551 (544-559)	1835 (1700-1970)	100

TABLE VIII. Whitefish from Gregoire Lake, May, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
VI	2	11.1	414 (405-423)	1235 (1010-1460)	0
VII	3	16.7	474 (451-512)	1860 (1630-2180)	33
VIII	8	44.4	463 (430-498)	1684 (1300-2020)	75
IX	3	16.7	457 (450-467)	1667 (1590-1780)	67
X	2	11.1	471 (468-475)	1745 (1660-1830)	50

TABLE IX. Lake whitefish from Gregoire Lake, December, 1960 and December, 1963.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	1	1.9	335	455	0
IV	4	7.7	373 (340-410)	812 (685-1025)	25
V	8	15.4	419 (399-467)	1076 (885-1310)	50
VI	8	15.4	472 (427-508)	1453 (1195-1825)	87.5
VII	27	52	500 (447-731)	1624 (1170-2250)	44.4
VIII	4	7.7	485 (447-508)	1673 (1370-1880)	25

TABLE X. Cisco from Gregoire Lake, May, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	11	84.6	214 (180-234)	128 (60-170)	82
IV	2	15.4	259 (250-268)	255 (220-290)	50

TABLE XI. Commercial fishing record, Gregoire Lake.

Year	Lic.	Cisco	Perch	Pike	Walleye	Whitefish	Total
44/45	5	1,480		1,580	11,413	3,560	18,033
45/46	2			355	3,514		3,869
46/47	2			3,332	2,445		7,577
47/48	2			540	1,153		1,693
48/49	1				725		725
54/55	11			510	13,400	11,800	25,710
55/56	2		360		660	3,350	4,370
57/58	3		60	180	1,990	7,520	9,750
64/65	2			1,200			1,200
65/66	2			1,700		2,000	3,700

TABLE XII. Water chemistry. Sample 1 is from Surmont Creek; sample 2 is from the Gregoire River.

Sample No.	1	2
Date	20-V-69	22-V-69
Depth (feet)	1	2
Temperature (^{o}C)	8	9
Dissolved oxygen (ppm)	10	10
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil
Total alkalinity (ppm $CaCO_3$)	40	50
Calcium hardness (ppm $CaCO_3$)	30	35
Total hardness (ppm $CaCO_3$)	40	50
pH	7.2	7.8
Total dissolved solids (ppm)	29	83

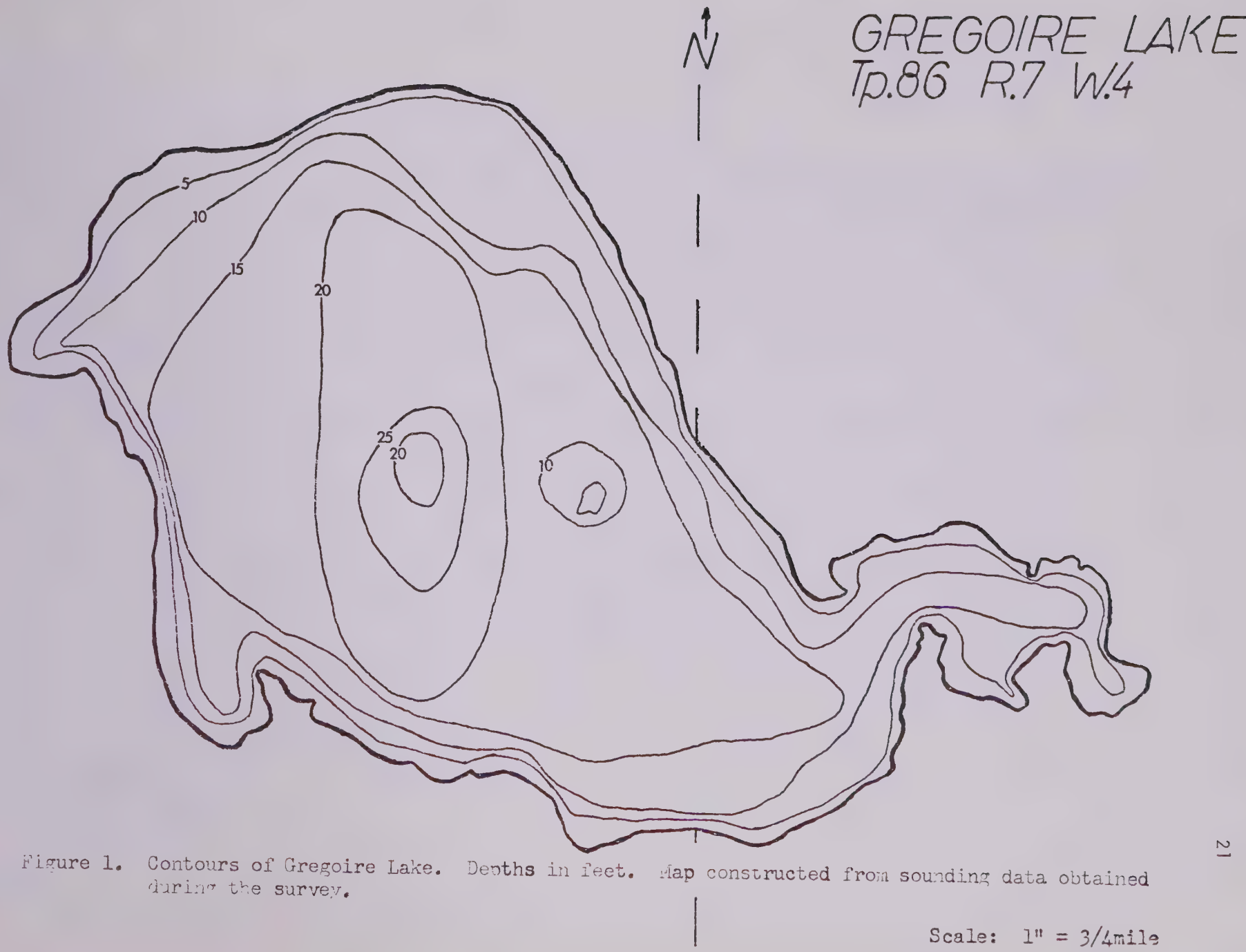


Figure 1. Contours of Gregoire Lake. Depths in feet. Map constructed from sounding data obtained during the survey.

Figure 2. Bottom sampling stations on Gregoire Lake, May, 1969.

GIPSY LAKE

Gipsy Lake was surveyed from 24 to 27 May and from 5 to 8 June 1969 to assess its fishery potential. It is located approximately 40 miles southeast of Fort McMurray in Townships 85 and 86, Range 2, west of the fourth meridian (latitude 56° 27' N, longitude 110° 15' W) (Fig. A). Gipsy Lake is at an approximate altitude of 1,580 feet m.s.l. It has no inflowing or outflowing streams although two old stream beds were located. The lake is accessible only by plane in the summer and by a winter road.

The immediate surrounding terrain is hilly and covered with a mixed forest of spruce, poplar and birch.

Gipsy Lake was commercially fished in 1954/55 and in March and April of 1969 (Table VIII). Lake whitefish comprised the bulk of the catch; 37,300 pounds were taken in 1969.

Morphometry

The shoreline of Gipsy Lake is 25.4 miles long and the surface area is 13.4 square miles, giving a shoreline development factor of 1.96. The maximum effective length of the lake is 4.03 miles in a northwest-southeast direction, almost parallel to the direction of the summer winds. The maximum effective width is 4.03 miles.

Depths were taken with a Furuno echo sounder and the results were used to plot a bottom contour map (Fig. 1).

The volume of the lake was calculated as 149,358 acre feet with a mean depth of 17.4 feet. The maximum depth recorded was 44 feet.

The shoreline is almost entirely gravel and rubble with only two small sand beaches. Emergent and submergent aquatic vegetation was limited to the large shallow bay at the northeast end of the lake.

Physical and Chemical Data

Two water samples were taken at the limnology station 5 June 1969; one at the surface and one from a depth of 33 feet. The air temperature was 26°C, the sky was clear and it was calm. The Secchi disc reading was 12 feet. Water temperatures were taken, these varying from 13.6°C at the surface to 9°C at the bottom. No significant stratification was yet in evidence. Dissolved oxygen was 10 ppm at the surface and 8 ppm at the bottom. All other results were identical for surface and bottom and are shown in Table II.

Plankton

A single vertical plankton haul from a depth of 33 feet was taken at the limnology station, using a Wisconsin plankton net with a mouth diameter of 20 centimeters. *Cladophora* and *Ulothrix*, green algae; *Stephanodiscus*, a diatom; and *Nostoc*, a blue-green alga were the most abundant phytoplankters (Table III). Rotifers were the only zooplankters that occurred in significant numbers but there were some copepods and cladocerans present.

Bottom fauna

Thirty-four bottom samples were taken, each consisting of a single 6" x 6" Ekman dredging taken at the locations shown in Figure 2. The dredging indicated that most of the lake bottom with depths of 15 feet

or greater is brown mud, while at depths less than 15 feet sand is dominant. The standing crop of bottom fauna was calculated as 1,260 organisms per square meter. Chironomids were the most abundant group followed by the amphipods. The bottom fauna results are shown in Table IV.

Fish fauna

Six 12-hour net sets totalling 650 yards in length were made during the survey, the mesh sizes varying from 1½ to 5½ inches (Table V). The species netted were lake whitefish (Coregonus clupeaformis), and northern pike (Esox lucius). A seine haul was made and yellow perch (Perca flavescens) and Iowa darters (Etheostoma exile) were taken.

Lake whitefish

Ninety-six whitefish were netted and 50 of these were worked. The fish are moderately sized (Table VI) all weighing between 1½ and 3½ pounds. All but one of the whitefish caught were 6 years or older and were mature at 6 years of age. Twenty-nine fish were examined for cysts of Triaenophorus crassus and 20 were found to be infected. In total, 78.52 pounds of fish contained 105 cysts giving an infestation rate of 134 cysts per 100 pounds of fish. Infestation rates from earlier counts are given in Table IX.

Northern pike

One hundred and six northern pike were netted and 45 of these were worked (Table VII). Several of these weighed 8½ to 9 pounds although most were between 2 and 3 pounds. They appear to mature at 4 to 6 years of age.

Discussion and Conclusion

Using the Ryder morpho-edaphic index, a productivity figure of 5 pounds of fish per acre per year can be postulated for Gipsy Lake. This would result in about 43,000 pounds of fish being produced annually. Of this total, approximately 14,300 pounds would be pike and 28,700 pounds would be whitefish.

Gipsy Lake is currently being commercially fished for whitefish and to a lesser extent for pike. Because of the high infestation rate of Triaenophorus in the whitefish the commercial value of this fish is reduced.

The lake also has great potential as a recreational area if access into the lake is provided. The clear water, sandy beaches, scenic surroundings and the pike population would attract fishermen and vacationers from Fort McMurray and district.

TABLE I. Morphometry of Gipsy Lake. (Soundings were taken with a Furuno sounder during May, 1969). Other data were taken from maps at a scale of one inch to one mile.

LOCATION: Tp. 85, Rge. 2; Tp. 86, Rge. 2, W. 4

AREA: 13.4 sq. mi. (8,582 acres)

VOLUME: 149,358 acre feet

SHORELINE: 25.4 miles

SHORELINE DEVELOPMENT FACTOR: 1.96

MAXIMUM LENGTH: 5.19 miles

MAXIMUM EFFECTIVE LENGTH: 5.19 miles

MAXIMUM WIDTH: 4.03 miles

MAXIMUM EFFECTIVE WIDTH: 4.03 miles

MEAN WIDTH: 2.58 miles

MAXIMUM DEPTH: 44 feet

MEAN DEPTH: 17.4 feet

DEPTH DISTRIBUTION:

Contour Interval	Acres	% Surface Area
0- 5 feet	2,208	26
5-15 feet	2,080	24
15-25 feet	1,126	13
25-35 feet	2,259	26
35 feet plus	909	11
Total Surface Area	8,582 acres	100%

TABLE II. Water Chemistry, Gipsy Lake. Sample 1 was taken at 33 feet, and sample 2 at the surface.

Sample No.	1	2
Date	6-VI-69	6-VI-69
Depth (feet)	33	Surface
Temperature (^{o}C)	23	23
Dissolved oxygen (ppm)	8	10
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil
Total alkalinity (ppm $CaCO_3$)	160	160
Calcium hardness (ppm $CaCO_3$)	130	130
Total hardness (ppm $CaCO_3$)	135	135
pH	8.8	8.8
Total dissolved solids (ppm)	236	236

TABLE III. Plankton sample, Gipsy Lake, June 5, 1969.

Group	Relative Abundance*
A. Phytoplankton	
Chlorophyta	
Cladophora sp.	4
Pediastrum sp.	3
Scenedesmus sp.	2
Ulothrix sp.	4
Chrysophyta	
Asterionella sp.	3
Fragilaria sp.	3
Stephanodiscus sp.	4
Cyanophyta	
Anabaena sp.	1
Microcystis sp.	1
Nostoc sp.	4
Pyrrophyta	
Ceratium sp.	2
B. Zooplankton	
Rotifera	
Rotifers	3
Arthropoda	
Cladocerans	tr.
Copepods	tr.

* Relative Abundance Scale - trace, 1, 2, 3, 4, 5, bloom.

Total Vertical Haul (33')

TABLE IV. Bottom fauna analysis, Gipsy Lake. A total of 34 - ¼ sq. ft. dredgings were taken in June. The following figures are standardized to square meters.

Organisms	No./m^2	% Total No.
Chironomidae	882	70
Ephemeroptera	41	3.3
Trichoptera	25	2.0
Amphipoda	231	18.3
Oligochaeta	32	2.5
Hirudinea	3	0.2
Pelecypoda	20	1.6
Gastropoda	25	2.0
Coleoptera	1	0.1
TOTALS	1,260	100.0

TABLE V. Summarized catch record for Gipsy Lake, May and June, 1969.

Date Set & Pulled	Set No.	Mesh Size	Set Length	Set Depth (ft.)	Lake Whitefish	Northern Pike	Total
25-26-V-69	6	1½	50 yds	24	0	1	1
25-26-V-69	6	3½	50 yds	24	1	25	26
25-26-V-69	6	5½	50 yds	25	1	1	2
26-27-V-69	7	5½	50 yds	10	12	4	16
16-17-V-69	7	3½	50 yds	12	1	52	53
26-27-V-69	7	1½	50 yds	15	0	2	2
5- 6-VI-69	8	5½	50 yds	30	20	0	20
5- 6-VI-69	8	4½	50 yds	30	7	0	7
5- 6-VI-69	8	2½	50 yds	30	0	9	9
6- 7-VI-69	9	5½	50 yds	30	20	1	21
6- 7-VI-69	9	4½	50 yds	30	10	2	12
6- 7-VI-69	9	2½	50 yds	30	1	7	8
7- 7-VI-69	10	5½	50 yds	33	22	0	22
TOTALS					95	104	199

TABLE VI. Lake whitefish from Gipsy Lake, May-June, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
V	1	2.0	377	790	0.0
VI	5	10.0	414 (400-445)	1084 (990-1240)	60.0
VII	11	22.0	420 (390-480)	1170 (910-1540)	45.5
VIII	17	34.0	444 (413-473)	1315 (1080-1550)	35.3
IX	12	24.0	454 (424-488)	1363 (1150-1540)	41.7
X	2	4.0	467 (450-483)	1410 (1330-1490)	50.0
XI	2	4.0	476 (460-492)	1590 (1400-1780)	50.0

TABLE VII. Northern pike from Gipsy Lake, May-June, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
IV	13	28.9	485 (445-535)	792 (610-1000)	38.5
V	20	44.4	534 (487-620)	1045 (710-1520)	55
VI	7	15.6	554 (501-633)	1141 (880-1560)	43
VII	1	2.2	775	2860	100
VIII	2	4.4	798 (790-805)	3640 (3530-3750)	100
IX	2	4.4	790 (780-800)	3765 (3560-3970)	100

TABLE VIII. Commercial fishing record, Gipsy Lake.

Year	Lic.	Mixed	Tullibee	Perch	Walleye	Pike	Trout	Whitefish	Total
54/55	14							11,920	11,920
1969	7					3,520		37,300	40,820

TABLE IX. Rates of infestation of Triaenophorus crassus in lake whitefish from Gipsy Lake.

Year	R.O.I. (Cysts/100 lbs.)
1945	20.6
1948	13.5
1954	148.5
1955	147.8
1960	237
1963	252.2
1969	166.6

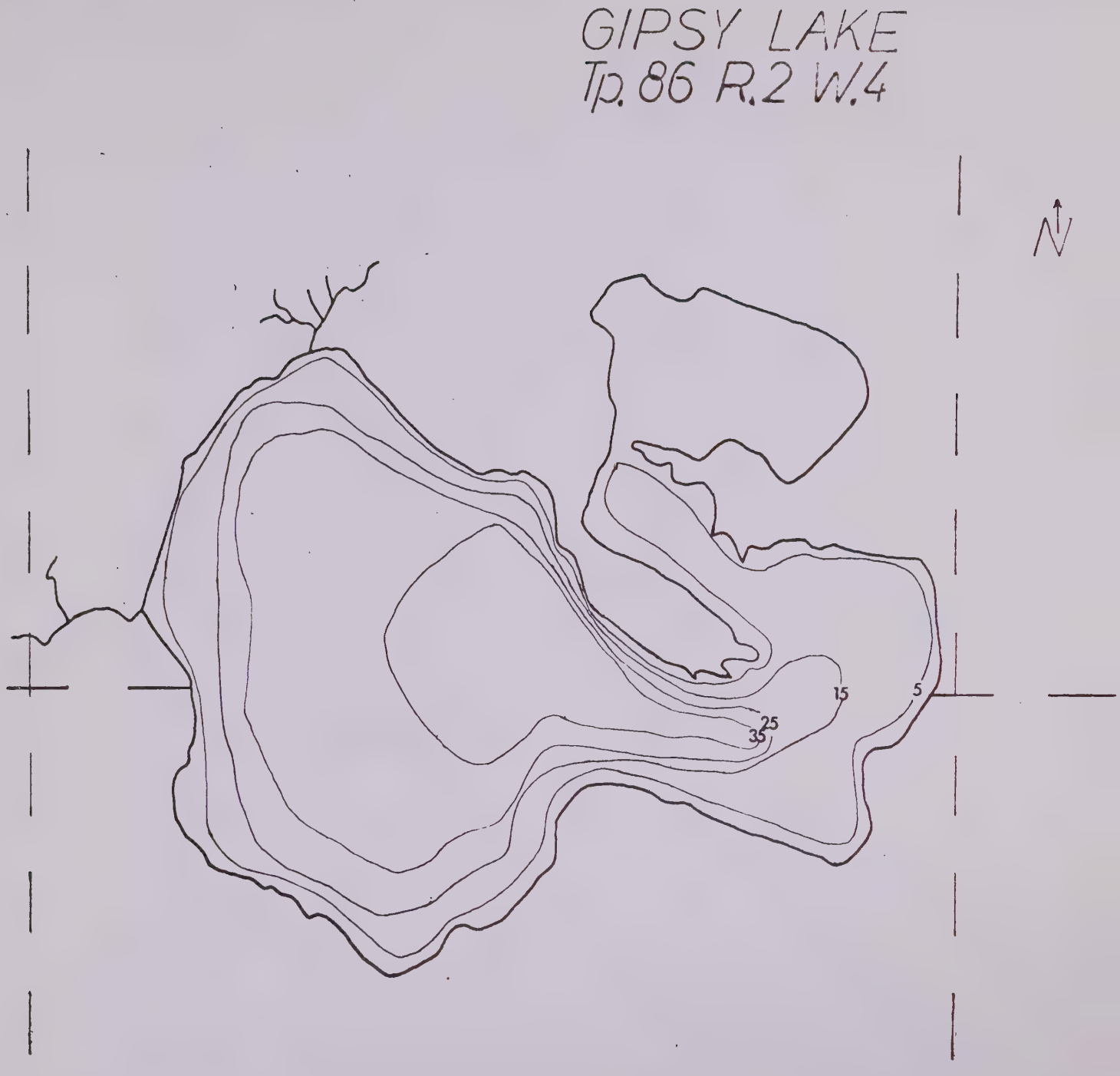


Figure 1. Bottom contours of Gipsy Lake, May, 1969.

Scale: 1" = 1mi.

Legend

• dredging site

net set

■ limnology station

Figure 2. Positions of dredging sites, net sets, and limnology station on Gipsy Lake, June 5-8, 1969.

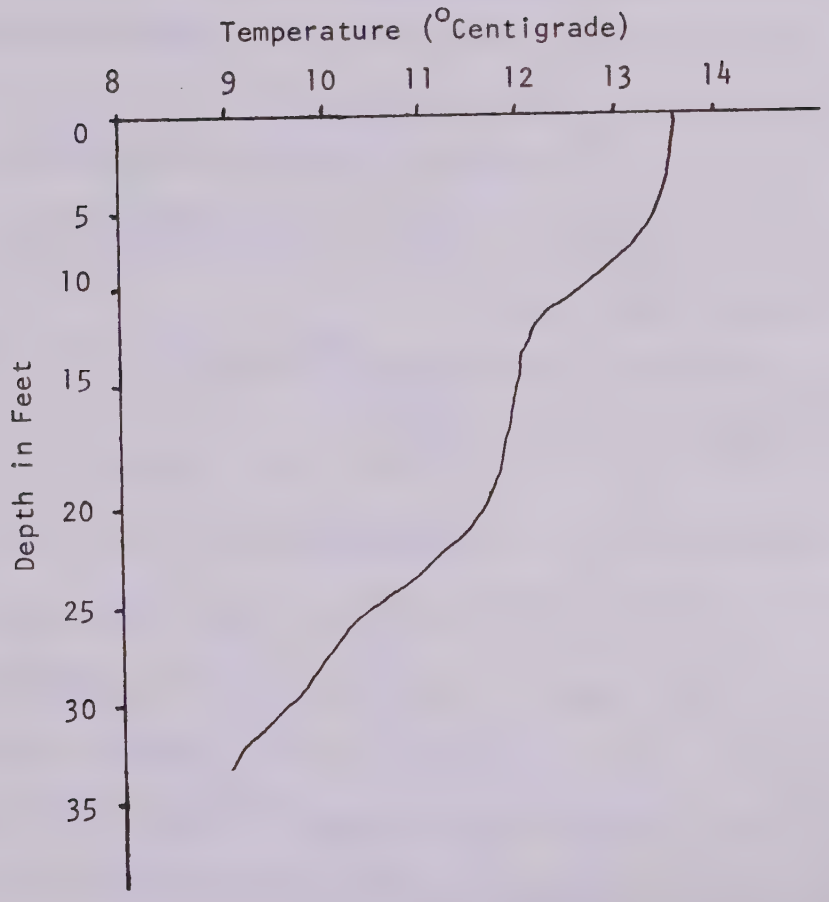


Figure 3. Thermal profile of Gipsy Lake, June 5, 1969.

CHRISTINA LAKE

Christina Lake was surveyed from 12 to 19 June, 1969 to assess its fishery potential. This lake is located in Townships 76 and 77, Ranges 5 to 7, west of the fourth meridian (latitude 54° 40' N, longitude 111° 0' W) is approximately 80 miles south of Fort McMurray (Fig. A). The elevation of the lake is approximately 1,818 feet m.s.l. Men and equipment were flown in by floatplane although the lake is accessible by road and railway.

The lake is surrounded by low hills covered with a mixed forest of birch, poplar and spruce. Much of the lakeshore is fringed by willows and swampy areas.

Commercial fishing records indicate that this lake has been heavily fished in the past (Table X).

Morphometry

The surface area of Christina Lake is 8.24 square miles and the shoreline length is 36.3 miles giving a shoreline development factor of 3.57. This is indicative of the elongated, narrow shape of the lake. The maximum effective length is 4.89 miles in an east-west direction and the maximum effective width is 1.22 miles. Depths were taken with a Furuno echo sounder and the results were used to plot a bottom contour map (Fig. 1). From this data a volume of 299,067 acre feet was calculated giving a mean depth of 57 feet. The maximum depth recorded was 108 feet. From the depth distribution (Table I) it can be seen that only 9 percent of the lake is less than 10 feet in depth. One of the most striking features of the lake is the abruptness of the drop-off. In places it was 40 to 50 feet deep only 30 feet from shore.

The shoreline of the lake is composed mainly of gravel and sand which forms extensive beach areas. Very little aquatic vegetation was observed except in the two northern bays on the east end of the lake and in the bay on the west end of the lake from which the Jackfish River drains.

Inflow-Outflow

Christina Lake has six inlet streams. Natives claim that several of these streams support grayling populations in their upper reaches. Water temperatures in the streams were in the 13 to 15°C range and there was no measurable current velocity. The water was a tea brown color in all of the stream.

The only outlet is the Jackfish River which originates at the western end of the lake. The first 1½ miles of the river are very shallow and clogged with weeds. The water is very clear and has a temperature of 15°C. Beyond this section, the river becomes narrow and fast flowing with many rapids. At this point it is 50 to 75 feet in width and has a maximum depth of 3 feet. The bottom is composed of gravel and large boulders. Tremendous numbers of caddis fly cases were observed. Reports indicate that the river supports a large population of grayling.

Physical and Chemical Data

Two limnology stations were set up (Fig. 2B), one in the west end and one in the east end of the lake. The air temperature was 18°C with clear skies and a light wind. Water temperatures were recorded every 5 feet and ranged from 14.5°C at the surface to 4.2°C at 93 feet. As indicated by the thermal profile (Fig. 3) significant stratification

had not yet occurred. The transparency rating was 11.5 feet in the west bay and 9.5 feet in the east bay. The water analyses results shown in Table II indicate the limnological differences between the eastern and western bays. Oxygen concentrations were 11 ppm at the surface and 6 ppm at the bottom which indicates a limited turnover. This is probably due to the reduced wind action on the lake because of its east-west orientation and the surrounding hills.

Plankton

Three plankton hauls were made. One from 83 feet in the eastern half and two from 30 feet and 93 feet in the western half of the lake. Slight differences in species diversity and frequency occurred between the samples (Table III). The predominant phytoplankters were the diatoms Asterionella, Stephanodiscus, and Tabellaria. Zooplankton was very limited.

Bottom fauna

Forty-four bottom samples, each consisting of a single 6" x 6" Ekman dredging, were taken from the locations shown in Figure 2A. These show the bottom type to be grey or brown mud in the deeper areas and sand in shallow areas. The standing crop of bottom fauna was calculated as 1,624 organisms per square meter with a volume displacement of 4.66 cc per square meter.

Chironomids were the most numerous organisms but amphipods exhibited the greatest displacement volume. The bottom fauna results are shown in Table IV.

Fish fauna

Eight 12-hour net sets were made by the survey crew in 1969, with a total of 1,000 yards of net in all being set (Fig. 2B). The net sizes were 1½", 2½", 3½", 4½", and 5½ inches. In January 1971, Fish and Wildlife personnel made five net sets, one of 18½ hours and four of approximately 40 hours. They set a total of 500 yards of 5½ inch net (Table IX). The outstanding difference between the two tests is that almost no lake whitefish were taken by the survey crew in 1969 while they made up the predominant part of the catch in 1971. This may be due to lack of movement by the whitefish during the summer months.

Fish taken included lake whitefish (Coregonus clupeaformis), cisco (Coregonus artedii), walleye (Stizostedion vitreum), northern pike (Esox lucius), perch (Perca flavescens), white sucker (Catostomus commersoni) and burbot (Lota lota).

Lake whitefish

One hundred and forty-two lake whitefish were netted and of these, 61 were worked (Table V). The fish taken were of a moderate size, the largest weighing 4 pounds. They have a slow growth rate and reach maturity at 5 to 6 years of age.

Thirty-eight fish were examined for cysts of Triaenophorus crassus and 13 were found to be infected. In total 110.5 pounds of fish contained 17 cysts giving an infestation rate of 15.5 cysts per 100 pounds of fish.

TABLE I. Morphometry of Christina Lake. (Soundings were taken with a Furuno echo sounder during June, 1969). Other data were taken from maps at a scale of one inch to one mile.

LOCATION: Tp. 76, Rge. 5; Tp. 76, Rge. 6; Tp. 76, Rge. 7; Tp. 77, Rge. 6; Tp. 77, Rge. 7, W. 4

AREA: 8.24 sq. mi. (5,274 acres)

VOLUME: 299,067 acre feet

SHORELINE: 36.3 miles

SHORELINE DEVELOPMENT FACTOR: 3.57

MAXIMUM LENGTH: 8.05 miles

MAXIMUM EFFECTIVE LENGTH: 4.89 miles

MAXIMUM WIDTH: 1.22 miles

MAXIMUM EFFECTIVE WIDTH: 1.22 miles

MEAN WIDTH: 1.02 miles

MAXIMUM DEPTH: 108 feet

MEAN DEPTH: 57 feet

DEPTH DISTRIBUTION:

Contour Interval	Acres	% Surface Area
0-10 feet	455	9
10-30 feet	416	8
30-35 feet	1,702	32
55-65 feet	749	14
65-85 feet	922	17
85-100 feet	492	10
100-105 feet	237	4
105 feet plus	301	6
Total Surface Area	5,274	100%

TABLE II. Water chemistry, Christina Lake. Sample numbers 1 and 2 were taken in the east bay at the surface and bottom respectively. Sample numbers 3 and 4 were taken in the west bay at the surface and bottom respectively.

Sample No.	1	2	3	4
Date	16-6-69		17-6-69	
Depth (feet)	surface	83	surface	93
Dissolved oxygen (ppm)	11	6	10	6
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil	nil	nil
Total alkalinity (ppm $CaCO_3$)	105	120	100	120
Calcium hardness (ppm $CaCO_3$)	62	61	65	70
Total hardness (ppm $CaCO_3$)	105	92	100	110
pH	7.6	7.2	7.9	7.3
Total dissolved solids (ppm)	145	145	187	201

TABLE III. Plankton samples, Christina Lake, June 16 and 17, 1969. Sample number 1 is from the east bay; sample numbers 2 and 3 are from the west bay.

Group	Relative Abundance*		
Sample	1	2	3
A. Phytoplankton			
Chlorophyta			
Cladophora sp.	3	1	2
Scenedesmus sp.	2	-	-
Ulothrix sp.	3	-	-
Chrysophyta			
Asterionella sp.	4	3	3
Fragilaria sp.	3	2	2
Stephanodiscus sp.	4	3	3
Tabellaria sp.	4	2	1
Cyanophyta			
Anabaena sp.	2	tr.	tr.
Microcystis sp.	2	tr.	2
Nostoc sp.	3	3	3
Pyrrophyta			
Ceratium sp.	2	2	1
B. Zooplankton			
Arthropoda			
Cladocerans	tr.	-	-
Copepods	tr.	tr.	tr.
Rotifera			
Rotifers	2	2	2
Settled Volume of Sample (mls.)	0.82	0.5	1.02

* Relative Abundance Scale - trace, 1, 2, 3, 4, 5, bloom.

Total Vertical Haul (83', 30', 93')

TABLE IV. Bottom fauna analysis of Christina Lake. A total of 44 - ¼ sq. ft. dredgings were taken during June 14 - 15, 1969.

Organisms	No./m^2	% Total No.	Volume/m^2 (mls)	% Total Volume
Chironomidae	833	51.3	1.21	26
Ephemeroptera	5	0.3	-	-
Trichoptera	8	0.5	-	-
Amphipoda	691	42.6	3.45	74
Oligochaeta	33	2.0	-	-
Hirudinea	1	-	-	-
Pelecypoda	41	2.5	-	-
Gastropoda	12	0.7	-	-
TOTALS	1624	99.9	4.66	100

TABLE V. Whitefish from Christina Lake, June, 1969 and January, 1971.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.
IV	2	3.4	323 (320-326)	470 (400-540)
V	3	5	373 (350-388)	738 (625-850)
VI	1	1.7	390	810
VII	4	6.8	418.5 (396-438)	1027.5 (930-1130)
VIII	21	35.6	441 (401-474)	1198 (1010-1600)
IX	24	40.7	450 (407-473)	1247 (940-1810)
X+	4	6.8	490.5 (467-515)	1630 (1500-1880)

TABLE VI. Cisco from Christina Lake, June, 1969 and January, 1971.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.
II	2	2.7	184 (172-195)	90 (70-110)
III	11	15.2	236 (210-250)	164 (140-180)
IV	14	19.2	247 (235-266)	182 (140-230)
V	24	32.9	245 (222-269)	186 (150-260)
VI	18	24.6	262 (246-278)	232 (180-290)
VII	3	4.1	281 (270-298)	310 (290-350)
IX	1	1.3	326	500

TABLE VII. Walleye from Christina Lake, June, 1969 and January, 1971.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.
II	1	2.2	282	260
III	20	44.4	346 (300-387)	464 (300-630)
IV	14	31.1	411 (382-455)	772 (580-1090)
V	6	13.3	435 (418-462)	929 (800-1060)
IX+	4	8.9	602.5 (578-630)	2390 (2110-2860)

TABLE VIII. Northern pike from Christina Lake, June, 1969 and January, 1971.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.
III	2	4.1	393.5 (362-425)	500 (410-590)
IV	8	16.3	465 (391-539)	754 (435-1160)
V	14	28.6	539 (449-638)	1212 (790-2100)
VI	13	26.5	667 (593-750)	2172 (1610-2725)
VII	7	14.3	687 (610-798)	2673.5 (1920-3900)
VIII	2	4.1	693 (665-721)	2950 (2610-3290)
IX	2	4.1	760 (743-777)	3750 (3460-4040)
X+	1	2	792	4920

TABLE IX. Summarized catch record for Christina Lake, June, 1969 and January, 1971.

Date Set & Pulled	Set No.	Mesh Size	Set Length	Set Depth (ft.)	Perch	Lake Whitefish	Northern Pike	Walleye	Cisco	Burbot	White Sucker	Total
15-VI-69	12	2½	50 yds	35	0	0	0	0	13	0		13
15-VI-69	12	4½	50 yds	50	0	0	0	1	0	0		1
15-16-VI-69	13	1½	50 yds	40	1	0	0	0	3	0		4
15-16-VI-69	13	3½	50 yds	50	0	0	1	0	0	2		3
15-16-VI-69	13	5½	50 yds	60	0	0	0	0	0	0		0
16-17-VI-69	15	1½	50 yds	35	0	0	0	0	0	0		0
16-17-VI-69	15	3½	50 yds	60	0	0	0	0	1	6		7
16-17-VI-69	15	5½	50 yds	80	0	1	0	0	0	1		2
16-17-VI-69	16	2½	50 yds	8	15	0	7	14	0	0	4	40
16-17-VI-69	16	4½	50 yds	8	0	0	2	2	0	0	26	30
17-18-VI-69	17	2½	50 yds	39	0	0	0	0	88	0		88
17-18-VI-69	17	4½	50 yds	34	0	0	1	0	0	0		1
17-18-VI-69	18	1½	50 yds	28	0	0	2	1	0	0		3
17-18-VI-69	18	3½	50 yds	34	0	5	2	0	0	2		9
17-18-VI-69	18	5½	50 yds	37	0	0	0	0	0	1		1
18-19-VI-69	20	1½	50 yds	90	0	0	0	0	0	0		0
18-19-VI-69	20	3½	50 yds	90	0	1	0	0	2	2		5
18-19-VI-69	20	5½	50 yds	90	0	0	1	0	0	0		1
18-19-VI-69	21	2½	50 yds	95	0	1	0	0	12	0		13
18-19-VI-69	21	4½	50 yds	95	0	1	1	0	0	0		2
15-19-VI-69			ANGLING		0	0	14	13	0	0		27
8-10-I-71	1	5½	100 yds	45-58		51	2	2	8			63
9-11-I-71	2	5½	100 yds	35		20	5	7	18	16	1	67
9-11-I-71	3	5½	100 yds	60		30	5	1	8	4		48
9-11-I-71	4A	5½	100 yds	60-75		30	5	2	11	9		57
8-9-I-71	4B	5½	100 yds	26-58		2	2	1	1	13		19
TOTALS			1500 yds		16	142	50	44	165	56	31	506

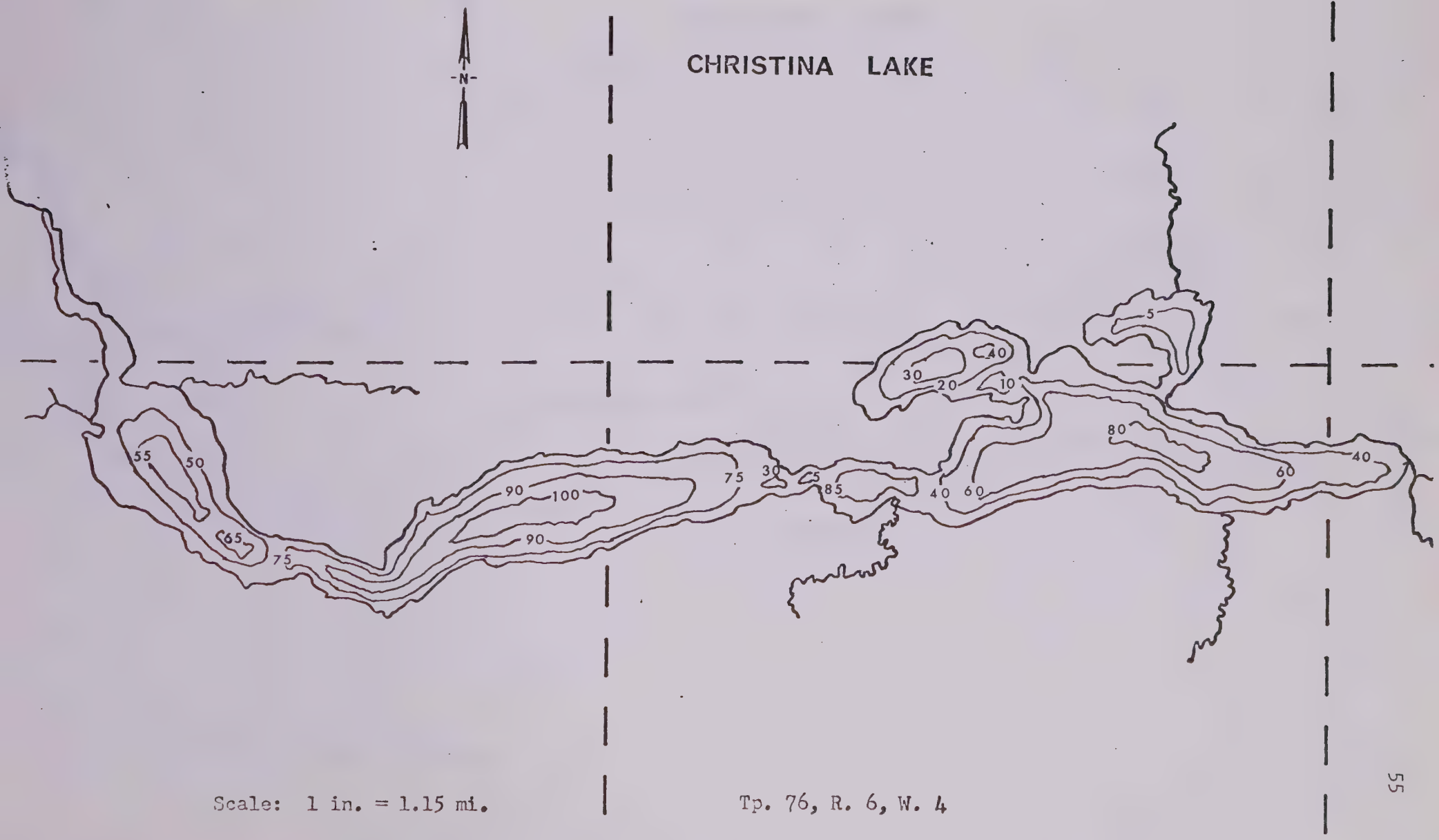
TABLE X. Commercial fishing record, Christina Lake.

Year	Lic.	Mixed	Cisco	Perch	Walleye	Pike	Trout	Whitefish	Total
42/43	5							5,600	5,600
43/44	8	200	3,200		2,300	200		13,000	18,900
44/45	7		12,000					262	12,262
45/46	10		26,205		465	2,209		11,710	40,589
46/47	11		17,745		900	13,740		15,400	47,785
47/48	9		19,523	814		2,141			22,478
48/49	6		43,024			14,909			57,933
49/50	9	1,015	72,434	4,753	10,886			5,760	94,848
50/51	7	1,955	74,136		987	10,000		9,255	96,333
51/52	10	1,835	68,847		735	12,363		18,343	102,123
52/53	5		25,638		1,982	4,685		12,709	45,014
53/54	4	1,750	7,810		1,500	1,920		1,680	14,660
51/55	11		22,150		1,641	3,054		17,531	44,376
55/56	8		4,220		6,475	1,340		21,516	33,571
56/57	6	275	7,240		1,820	1,440		25,741	36,560
57/58	7				175	140		27,065	27,380
59/60	8		28,800		308	11		25,944	55,063
59/60	7		22,000		669	4,884		26,292	53,845
60/61	6		22,500	480	702	87		23,501	47,270
61/62	6		13,925	527	12,426	4,425		17,738	44,041
62/63	6		9,300		16,919	6,540		10,351	42,240
63/74	7		16,810		4,979	1,421		5,261	28,471
64/65	6		15,800		2,372	3,139		1,365	22,677
65/66	9		3,015	782	8,846	6,780		3,288	22,711
66/67	2	375	8,800	100	2,859	530		1,576	14,240

TABLE XI. Water chemistry, Jackfish River.

Date	16-VI-69
Depth (feet)	1.5
Temperature (^{o}C)	25
Dissolved oxygen (ppm)	9
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil
Total alkalinity (ppm $CaCO_3$)	101
Calcium hardness (ppm $CaCO_3$)	65
Total hardness (ppm $CaCO_3$)	103
pH	7.7
Total dissolved solids	176

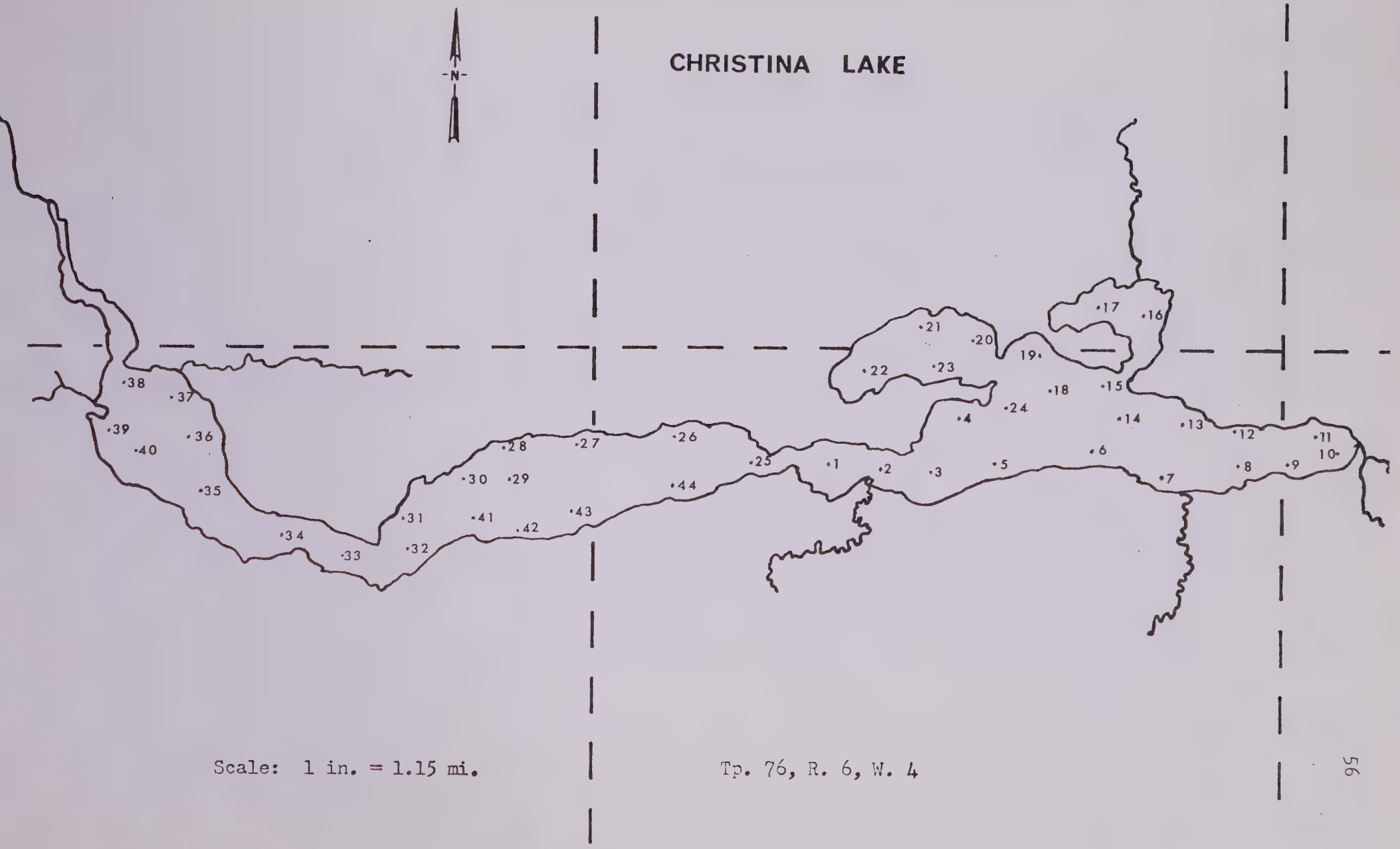
Figure 1. Bottom contours of Christina Lake.



Scale: 1 in. = 1.15 mi.

Tp. 76, R. 6, W. 4

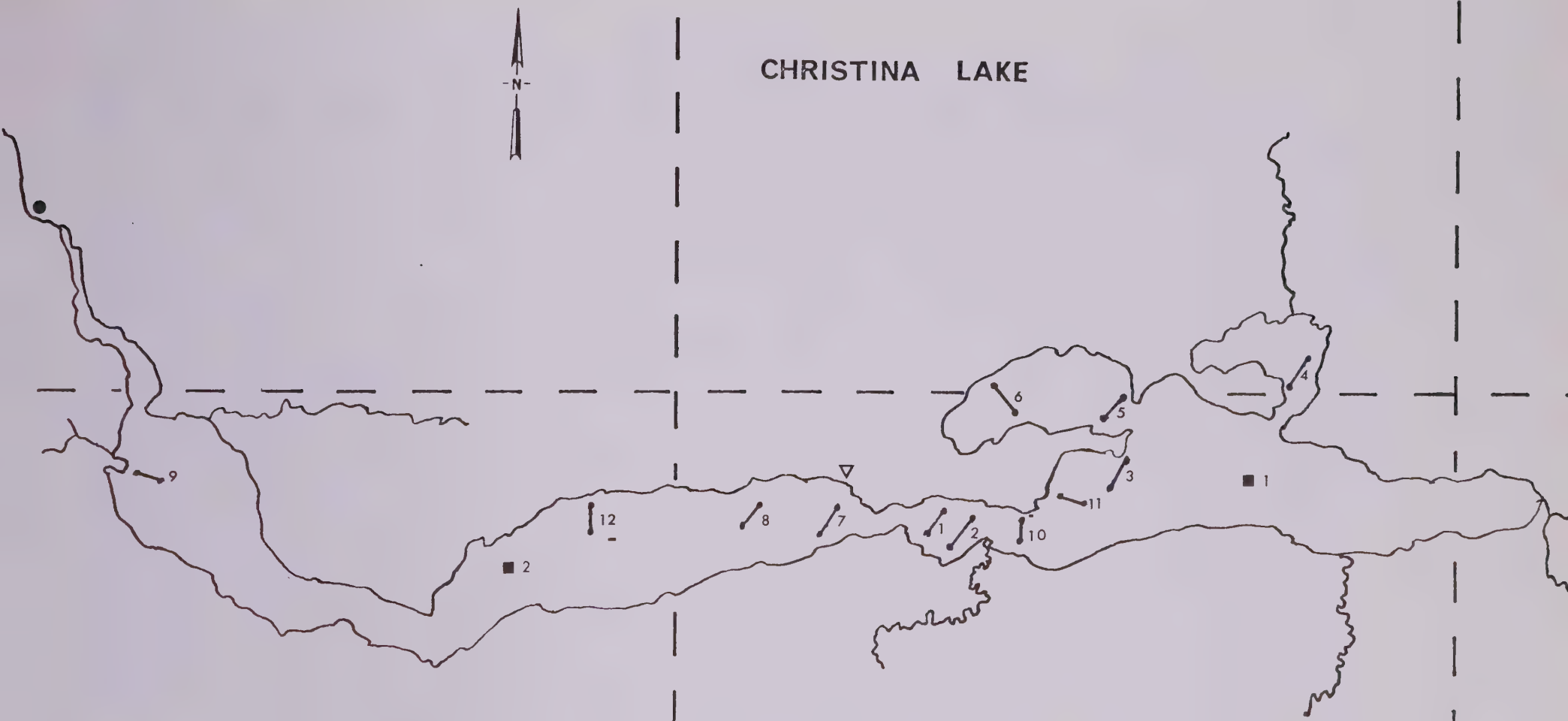
Figure 2A. Location of dredging sites on Christina Lake.



Scale: 1 in. = 1.15 mi.

Tp. 76, R. 6, W. 4

Figure 2B. Location of net sets and limnology stations, Christina Lake.



Scale: 1 in. = 1.15 mi.

Tp. 76, R. 6, W. 4

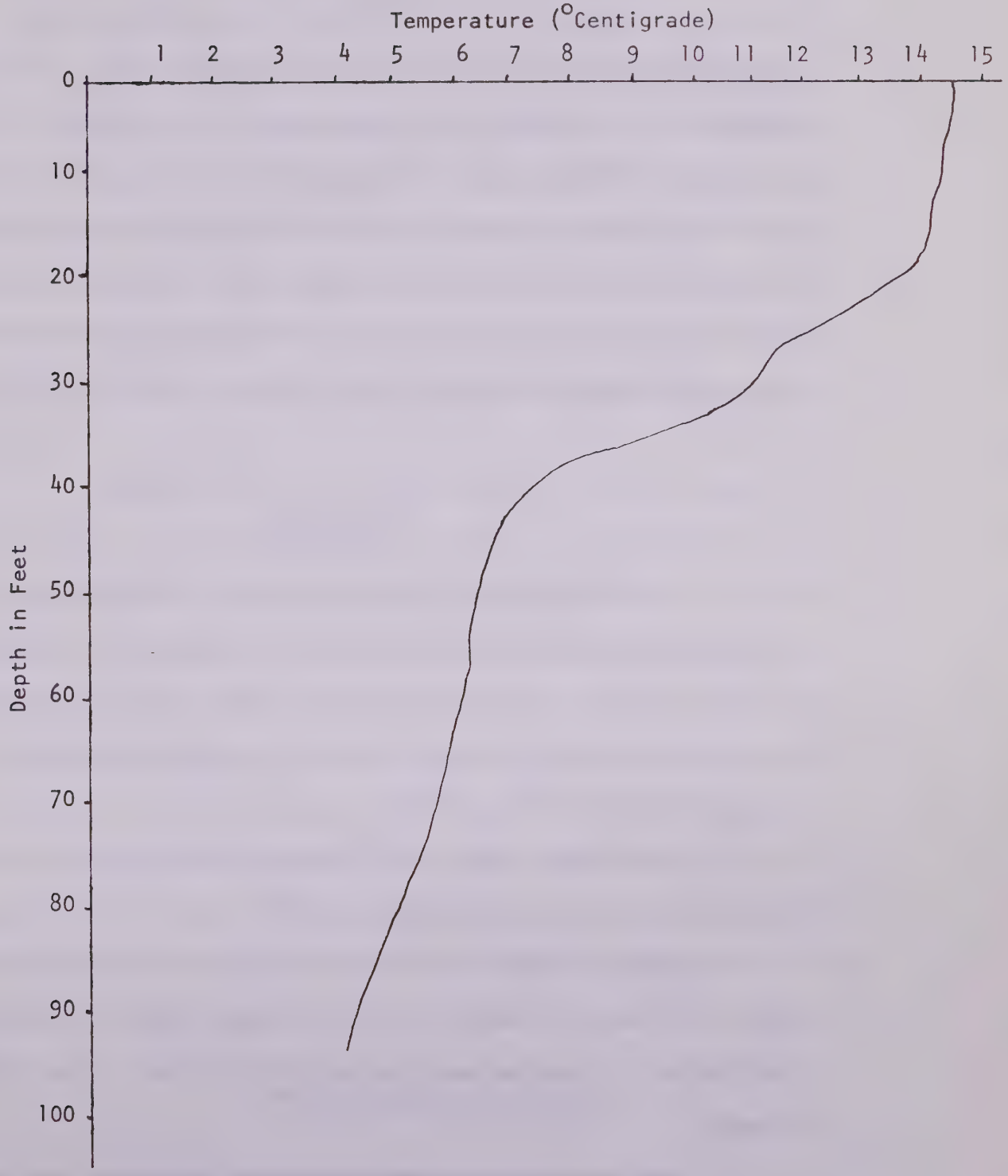


Figure 3. Thermal profile of Christina Lake, June 17, 1969.

PEARSON LAKE

Pearson Lake was surveyed from 9 to 12 July, 1969 to assess its fishery potential. This lake is located approximately 80 miles north of Fort McMurray and 7 miles east of the Athabasca River in Township 103, Range 8, west of the fourth meridian (latitude 57° 55' N, longitude 111° 15' W) (Fig. A). The elevation of the lake is approximately 825 feet m.s.l. There are no inflowing streams and only one small outflowing stream which drains into the Athabasca River. This area is inaccessible except by floatplane in the summer. The lake is located among high rolling sand hills covered with jackpine interspersed among the lowland areas of muskeg with black spruce and willow.

Morphometry

The surface area of Pearson Lake is 1.38 square miles and the shoreline length (including the shoreline of the two islands) is 9.7 miles giving a shoreline development factor of 2.33. The maximum effective length is 1.56 miles in a north-south direction and the maximum effective width is 1.21.

Depths were taken with a Furuno echo sounder and the results were used to plot a bottom contour map (Fig. 1).

The calculated lake volume is 14,900 acre feet. The maximum depth is 43 feet; the mean depth is 16.9 feet. From the depth distribution (Table I) it can be seen that half of the lake is less than 15 feet in depth.

The shoreline is composed mainly of sand with some small areas of rubble. Emergent and submergent vegetation have a limited distribution,

being confined to the small bays in the southwest and northeast parts of the lake.

Inflow-Outflow

The major inlet of the lake is from the south end. In this area there is a large shallow bay connected to the main body of the lake by a small creek. The average depth of this bay is less than 5 feet and the bottom consists of organic ooze. Areas of emergent vegetation are evident along the shore. This bay is important to the biology of the lake since it is a productive feeding area and provides nutrients to the main lake and is a significant pike spawning ground.

The major outlet of Pearson Lake is Eleanor Creek. Approximately 150 yards of the stream was surveyed. The stream flows through a wide willow flat that extends for 75 to 200 yards on either side. Channel braiding occurs almost immediately below the lake. The islands are unstable since they consist almost entirely of mud with little or no vegetational cover. The stream appears to have a highly variable discharge. The discharge was low at the time of the survey.

The stream averaged 5 to 6 feet in width with a mean depth of approximately 2 feet in the main channel. The stream did not exhibit a measurable current velocity. The section surveyed appeared to have no sport fishing potential.

Physical and Chemical Data

Two water samples were collected at the limnology station, one at the surface and one at 42 feet. The air temperature was 15°C; with

rain and winds gusting up to 20 miles per hour. Water temperatures were recorded every 5 feet, and varied from 19°C at the surface to 12°C at 42 feet. As indicated by the thermal profile (Fig. 3) stratification had occurred and a thermocline was established between 20 and 25 feet. The transparency rating was 9.5 feet. The concentration of dissolved oxygen at the surface was 8 ppm and 2 ppm at the bottom. The pH was 7.7 at the surface and 7.1 at 42 feet. Additional water analyses results are shown in Table II.

Plankton

One plankton haul of 40 feet was taken at the limnology station. The plankton was very limited in both numbers and diversity. As shown in Table III, the dinoflagellate, Ceratium was the only phytoplankter occurring in any number. Zooplankton included cladocerans, copepods, and rotifers. An approximate displacement volume of 0.90 ml was calculated for the plankton sample.

Bottom fauna

Twenty one bottom samples, each consisting of a single 6" x 6" Ekman dredging, were taken from the locations shown in Figure 2. These show that the bottom consists of organic ooze at depths greater than 10 feet with sand at depths less than 10 feet. The standing crop of bottom fauna was calculated as 674 organisms per square meter. Chironomids were the dominant group followed by amphipods. The bottom fauna results are shown in Table IV.

Fish fauna

Eight 12-hour net sets were made which amounted to a total of 900 yards of net being set in the survey (Table IX). Species netted included walleye (Stizostedion vitreum), northern pike (Esox lucius), cisco (Coregonus artedii), lake whitefish (Coregonus clupeaformis), and one white sucker (Catostomus commersoni). Rotenone was used to collect fish on Eleanor Creek. The species taken were spottail shiners (Notropis hudsonius), burbot (Lota lota), and white suckers.

Walleye

Sixty-two walleye were netted and 45 of these were worked (Table V). The age classes ranged from 3 years old with the majority being 5 and 6 years old. They appear to mature between 5 and 6 years of age. None of the walleye taken would be considered large since the heaviest individuals weighed 3 pounds.

Northern pike

Twenty-two northern pike were netted and worked (Table VI). They appear to mature between 5 and 6 years of age. Several individuals were of a good size, weighing 10 to 10½ pounds.

Cisco

Seventy cisco were netted and 45 of these were worked (Table VII). These fish were small with the largest weighing only three-quarters of a pound. They mature between 3 and 4 years of age. Thirty were examined for cysts of Triaenophorus crassus and all but two were infected. In total 16.5 pounds of fish were found to contain 249 cysts giving an

infestation rate of 1,509 cysts per 100 pounds.

Lake whitefish

Thirty-four lake whitefish were netted and worked (Table VIII). The fish taken were of a moderate size. The largest weighed less than 3 pounds. It appeared that the fish are mature before 6 years of age. Thirty fish were examined for cysts of Triaenophorus crassus and 22 were found to be infected. In total 71.2 pounds of fish were found to contain 188 cysts giving an infestation rate of 264 cysts per 100 pounds of fish.

Other species

Only one white sucker was netted although others were observed in Eleanor Creek. Since young burbot were collected in the creek it is reasonable to assume that there is a population of burbot in the lake.

Discussion and Conclusion

Pearson Lake has little or no value as a commercial fishery because of its small size, inaccessibility, and the high infestation rate of the cisco and whitefish.

At the present time the lake has little potential as a recreational area.

TABLE 1. Morphometry of Pearson Lake. (Soundings were taken with a Furuno echo sounder during July, 1969). Other data were taken from maps at a scale of three inches to one mile.

LOCATION: Tp. 103, Rge. 8, W. 4

AREA: 1.38 sq. mi. (883 acres)

VOLUME: 14,900 acre feet

SHORELINE: 9.7 miles

SHORELINE DEVELOPMENT FACTOR: 2.33

MAXIMUM LENGTH: 1.56 miles

MAXIMUM EFFECTIVE LENGTH: 1.56 miles

MAXIMUM WIDTH: 1.21 miles

MAXIMUM EFFECTIVE WIDTH: 1.21 miles

MEAN WIDTH: 1.12 miles

MAXIMUM DEPTH: 43 feet

MEAN DEPTH: 16.9 feet

DEPTH DISTRIBUTION:

Contour Interval	Acres	% Surface Area
0- 5 feet	160	18
5-15 feet	281	32
15-25 feet	218	25
25-35 feet	122	14
35-40 feet	89	10
40 feet plus	13	1
Total Surface Area	883	100%

TABLE II. Water chemistry, Pearson Lake. Sample 1 was taken at the surface and sample 2 at 43 feet.

Sample No.	1	2
Date	12-VII-69	12-VII-69
Depth (feet)	surface	43
Temperature (^{o}C)	17	17
Dissolved oxygen (ppm)	8	2
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil
Total alkalinity (ppm $CaCO_3$)	50	75
Calcium hardness (ppm $CaCO_3$)	50	50
Total hardness (ppm $CaCO_3$)	78	78
pH	7.7	7.1
Total dissolved solids (ppm)	159	195

TABLE III. Plankton sample, Pearson Lake, July 12, 1969.

Group	Relative Abundance*
A. Phytoplankton	
Chlorophyta	
Pediastrum sp.	1
Ulothrix sp.	1
Chrysophyta	
Fragilaria sp.	tr.
Tabellaria sp.	tr.
Cyanophyta	
Nostoc sp.	tr.
Pyrrophyta	
Ceratium sp.	3
B. Zooplankton	
Arthropoda	
Cladocerans	tr.
Copepods	2
Rotifera	
Rotifers	1

Settled Volume of Sample (mls)

* Relative Abundance Scale - trace, 1, 2, 3, 4, 5, bloom.

Total Vertical Haul (43')

TABLE IV. Bottom fauna analysis, Pearson Lake. A total of 21 - $\frac{1}{4}$ sq. ft. dredgings were taken on July 12, 1969. The following figures are standardized to square meters.

Organisms	No./m^2	% Total No.
Chironomidae	318	47
Ephemeroptera	43	6.4
Amphipoda	195	28.9
Trichoptera	12	1.8
Oligochaeta	49	7.3
Hirudinea	11	1.6
Pelecypoda	46	6.8
TOTALS	674	99.8

TABLE V. Walleye from Pearson Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	1	2.2	371	530	0.0
IV	6	13.3	319 (282-390)	363 (230-670)	33.3
V	14	31.1	403 (268-502)	684 (205-1160)	43.8
VI	16	35.6	463 (292-553)	1003 (295-1365)	87.7
VII	5	11.1	442 (391-498)	798 (580-1150)	60.0
VIII	2	4.4	489 (476-523)	1190 (1010-1370)	50.0
IX	1	2.2	435	835	0.0

TABLE VI. Northern pike from Pearson Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
V	5	23.8	578 (510-650)	1258 (890-1780)	80
VI	7	33.3	663 (520-750)	2009 (1280-2560)	71.4
VII	5	23.8	706 (498-810)	2326 (830-3450)	80
VIII	2	9.5	694 (612-775)	2258 (1315-3200)	100
IX	1	4.8	885	4635	100
X	1	4.8	900	4790	100

TABLE VII. Cisco from Pearson Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
II	1	2.2	178	90	100
III	3	6.7	220 (217-222)	160 (150-170)	100
IV	11	24.4	260 (245-285)	261 (200-340)	63.6
V	24	53.3	261 (241-300)	262 (210-345)	54.2
VI	6	13.3	274 (268-280)	310 (280-320)	50.0

TABLE VIII. Whitefish from Pearson Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	1	2.9	308	450	100
VI	4	11.8	387 (360-405)	963 (780-1210)	25
VII	11	32.4	408 (374-460)	1030 (830-1300)	72.7
VIII	7	20.6	392 (309-437)	1056 (860-1370)	85.7
IX	6	17.6	427 (409-444)	1223 (1090-1310)	100
X	5	14.7	421 (395-445)	1290 (1040-1510)	60

TABLE IX. Summarized catch record for Pearson Lake, July, 1969.

Date Set & Pulled	Set No.	Mesh Size	Set Length	Set Depth (ft.)	Lake Whitefish	Northern Pike	Walleye	Cisco	White Sucker	Total
10-11-VII-69	34	2½	50 yds	36	0	0	0	6	0	6
10-11-VII-69	34	4½	50 yds	15	7	2	7	0	0	16
10-11-VII-69	35	3½	50 yds	27	3	2	0	1	0	6
11-11-VII-69	36	1½	50 yds	35	0	0	2	0	0	2
11-11-VII-69	36	5½	50 yds	35	0	0	0	0	0	0
11-11-VII-69	37	2½	50 yds	25	0	1	0	5	0	6
11-11-VII-69	37	3½	50 yds	30	0	3	0	4	0	7
11-11-VII-69	37	4½	50 yds	35	0	0	0	0	0	0
11-12-VII-69	38	1½	50 yds	30	0	0	0	2	0	2
11-12-VII-69	38	5½	50 yds	30	0	1	1	1	0	3
11-12-VII-69	39	2½	50 yds	15	3	2	14	0	0	19
11-12-VII-69	39	3½	50 yds	15	4	3	30	0	1	38
11-12-VII-69	39	4½	50 yds	15	3	0	7	0	0	10
12-13-VII-69	40	1½	50 yds	22	0	0	1	6	0	7
12-13-VII-69	40	5½	50 yds	27	2	1	0	1	0	4
12-13-VII-69	41	2½	50 yds	32	1	1	0	40	0	42
12-13-VII-69	41	3½	50 yds	35	6	2	0	4	0	12
12-13-VII-69	41	4½	50 yds	39	0	0	0	0	0	0
TOTALS					29	18	62	70	1	180

TABLE X. Water chemistry, Eleanor Creek.

Sample No.	1
Date	11-VII-69
Depth (feet)	10
Temperature (^{o}C)	23.5
Dissolved oxygen (ppm)	7
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil
Total alkalinity (ppm $CaCO_3$)	90
Calcium hardness (ppm $CaCO_3$)	50
Total hardness (ppm $CaCO_3$)	80
pH	7.2
Total dissolved solids (ppm)	135

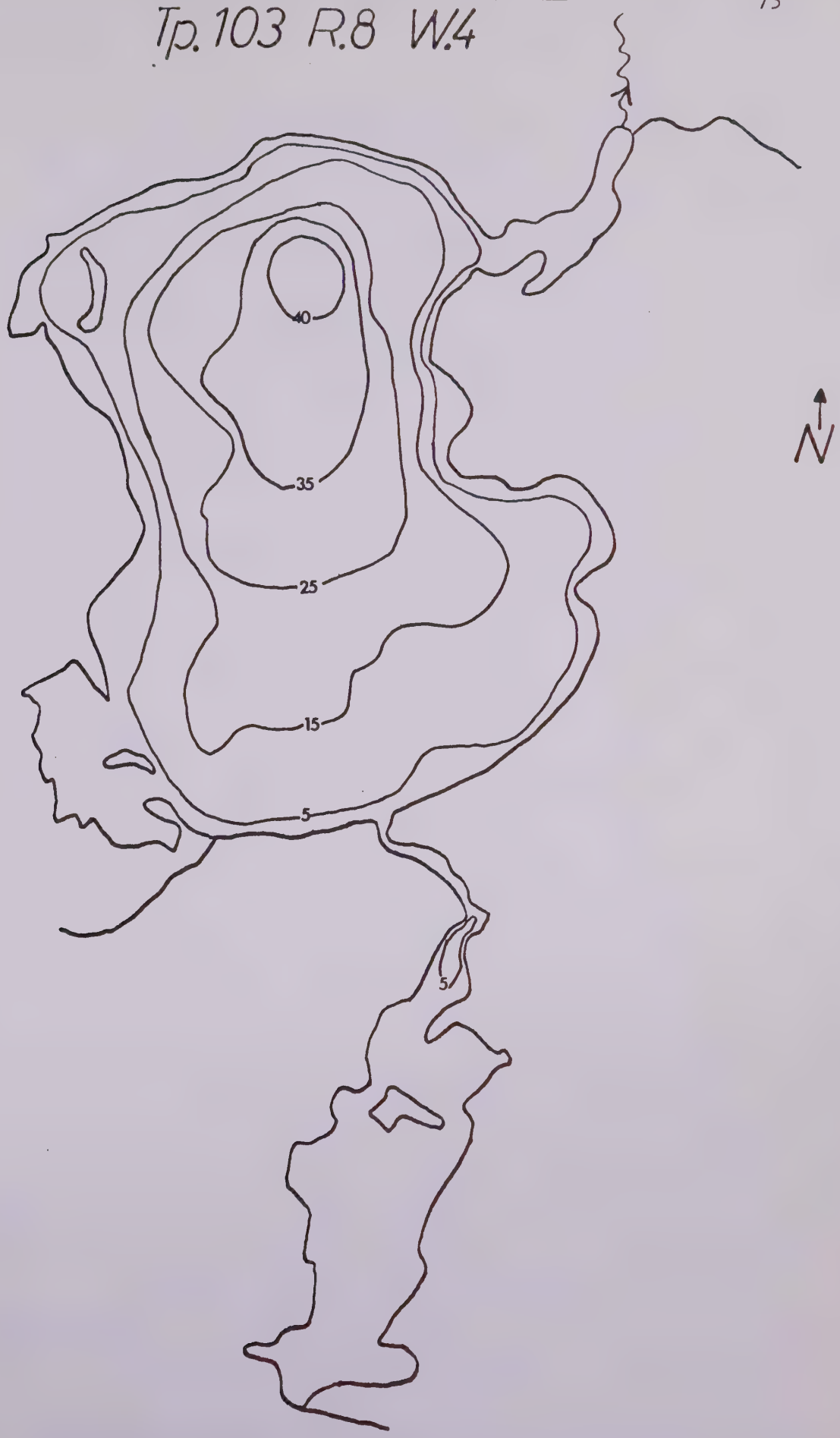


Figure 1. Bottom contours of Pearson Lake.

Scale: 3" = 1mi.

Figure 2. Positions of dredgings, net sets and limnology station.
Scale: 3" = 1mi.

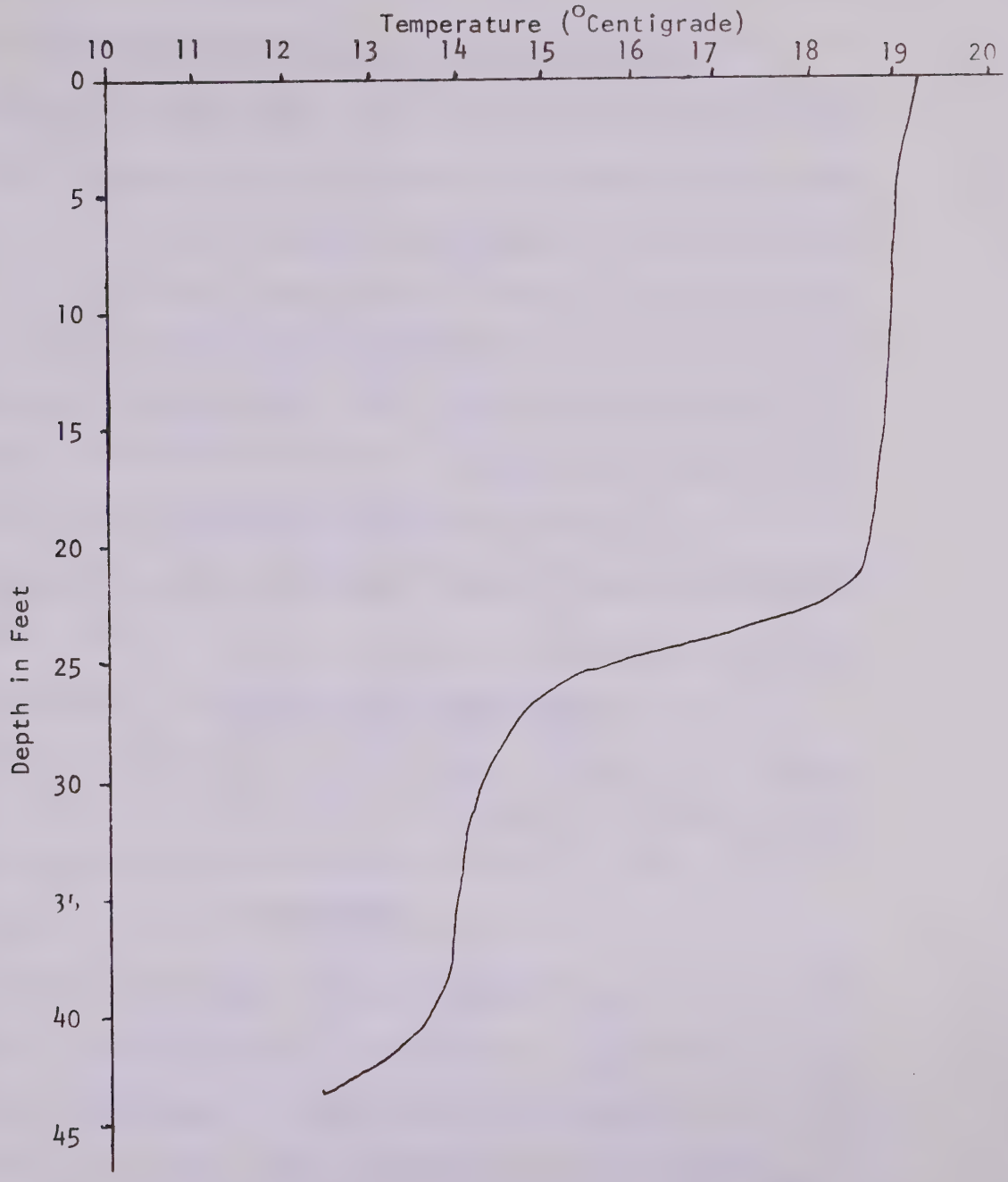


Figure 3. Thermal profile of Pearson Lake, July 12, 1969.

CHIPEWYAN LAKE

Chipewyan Lake was surveyed from 16 to 20 July, 1969 to assess its fishery potential. This lake is located approximately 80 miles west of Fort McMurray in Townships 91 and 92, Range 22, west of the fourth meridian (latitude 56° 57' N, longitude 113° 23' W) (Fig. A). The elevation of the lake is approximately 1,800 feet m.s.l. There is one inflowing and one outflowing stream which drains into Carrot Lake and then into the Wabasca River. The area is inaccessible except by floatplane in the summer.

Chipewyan Lake is located in a low lying muskeg area. The immediate surrounding terrain consists of low hills covered with a mixed forest of poplar, birch and spruce.

This lake was commercially fished until 1962/63 but is now reserved as a domestic fishery for the small community of native people located on the lake.

Morphometry

Chipewyan Lake has a surface area of 4.46 square miles and the shoreline length is 9.9 miles giving a shoreline development factor of 1.31. The maximum effective length is 3 miles in an east-west direction and the maximum effective width is 2.21 miles.

Depths were taken with a Furuno echo sounder and the results were used to plot a bottom contour map (Fig. 1).

The calculated lake volume is 42,088 acre feet. The maximum depth is 25 feet and the mean depth is 14.75 feet.

Most of the beaches of Chipewyan Lake are narrow strips of rubble and sand fronted by extensive beds of submergent and emergent

vegetation. The only gaps in these weed beds occur along the east shore and the middle of the north shore. In these areas the forest cover is so close to the water's edge that the beaches are again confined to narrow strips.

Inflow-Outflow

Two of the three inflowing streams indicated on the map are intermittent. The third stream which enters in the northwest corner of the lake is small and relatively insignificant. The outlet drains into Carrot Lake and then into the Wabasca River. This creek has no fishery potential. It is full of brush and debris and has no measurable current velocity.

Physical and Chemical Data

Two water samples were collected at the limnology station. One sample was taken at the surface and one at 20 feet. The air temperature was 18.5°C and it was sunny and calm.

Water temperatures were recorded every 3 feet and varied from 18°C at the surface to 14°C at 20 feet. As indicated by the thermal profile (Fig. 3) no stratification has occurred due to the shallowness of the lake. The transparency rating is 5.5 feet. The concentration of dissolved oxygen was 12 ppm at the surface and 9 ppm at the bottom. The pH was 8.8 at the surface and 8.4 at 20 feet. Additional water analysis results are shown in Table II.

Plankton

A single total vertical haul of 19 feet was taken at the

limnology station. At this time an extensive algal bloom was in progress. The predominant phytoplankters were Ulothrix, Fragilaria, and Anabaena. Other types of cladocerans, copepods and rotifers occurred in the sample. An approximate displacement volume of 1.1 mls was calculated for the plankton sample.

Bottom fauna

Twenty one bottom samples each consisting of a single 6" x 6" Ekman dredging were taken from the locations shown in Figure 2. These show the bottom type to be mainly organic ooze with some small areas of sand. Small areas of rubble and gravel occur in shallow areas along the north and east shores. The standing crop of bottom fauna was calculated as 1,586 organisms per square meter. Chironomids were the dominant group followed by amphipods and oligochaetes. The bottom fauna results are shown in Table IV.

Fish fauna

A total of 550 yards of net were set in the survey (Table V). Species netted include northern pike (Esox lucius), lake whitefish (Coregonus clupeaformis), cisco (Coregonus artedii), and yellow perch (Perca flavescens).

Northern pike

Forty-six northern pike were netted and 45 of these were worked (Table VI). Their age classes varied from 3 to 6 years of age and they appeared to mature between 4 and 5 years of age. These are not

large fish, the heaviest individual weighing only 4½ pounds. At the time of the survey the pike were feeding mainly on small perch.

Lake whitefish

Twelve lake whitefish were netted and worked (Table VII). They weighed between 3 and 6 pounds and all were mature. Nine were examined for cysts of Triaenophorus crassus and five were found to be infected. In total 40.86 pounds of fish were found to contain 15 cysts giving an infestation rate of 36.7 cysts per 100 pounds of fish. Nine of the 15 cysts were found in one fish.

Cisco

Seventy-nine cisco were netted and 45 of these were worked (Table VIII). They appear to mature at 4 years of age. The cisco are of medium size, the heaviest individual weighing between 2 and 2½ pounds. Thirty were examined for cysts of Triaenophorus crassus. Only five were infected. In total 44.4 pounds of fish were found to contain 22 cysts, giving an infestation rate of 49.5 cysts per 100 pounds of fish. This figure is misleading since 19 of the 22 cysts were found in two fish.

Perch

Forty-five perch were netted and 10 were worked (Table IX). All were mature. The largest weighing only half a pound.

Discussion and Conclusion

Using the Ryder morpho-edaphic index, a productivity figure of 7 pounds of fish per acre per year was calculated. This would result

in about 20,000 pounds of fish being produced annually. Of this 8,000 pounds would be cisco, 1,000 pounds whitefish, 5,000 pounds pike and 5,000 pounds perch.

The lake is currently supporting a domestic fishery. The whitefish are used for human consumption and the cisco are used as dog food.

In the 1959 and 1960 fishing seasons 81,567 pounds of whitefish were taken from the lake. Three years later only 150 pounds were caught. Personal communications with natives indicate that fishing was poor after the two years of over-exploitation. This suggests that the lake whitefish population was greatly reduced and has never made a recovery. As the natives currently fish the spawning grounds in the fall it is unlikely that it will recover.

The lake can be managed either as a whitefish or cisco fishery. If an attempt is made to establish a whitefish fishery the natives would have to stop fishing the spawning grounds and consideration could be given to planting eggs or fry. However, if a cisco and pike fishery is desired the allowable mesh size should be lowered to 4 inches or $4\frac{1}{2}$ inches as almost no pike or cisco are taken in $5\frac{1}{2}$ inch mesh nets. The lake should be reserved for domestic fishing until some decision is made as to its future.

As the lake is remote and not aesthetically pleasing it has a limited recreation potential.

TABLE 1. Morphometry of Chipewyan Lake. (Soundings were taken with a Furuno echo sounder during July, 1969). Other data were taken from maps at a scale of two and five-eighths inches to one mile.

LOCATION: Tp. 91, 92, Rge. 22, W. 4

AREA: 4.46 sq. mi. (2,854 acres)

VOLUME: 42,088 acre feet

SHORELINE: 9.90 miles

SHORELINE DEVELOPMENT FACTOR: 1.31

MAXIMUM LENGTH: 3 miles

MAXIMUM EFFECTIVE LENGTH: 3 miles

MAXIMUM WIDTH: 2.21 miles

MAXIMUM EFFECTIVE WIDTH: 2.21 miles

MEAN WIDTH: 1.49 miles

MAXIMUM DEPTH: 25 feet

MEAN DEPTH: 14.75 feet

DEPTH DISTRIBUTION:

Contour Interval	Acres	% Surface Area
0- 5 feet	377	13
5-10 feet	282	10
10-15 feet	499	18
15-20 feet	998	35
20-25 feet	640	22
25 feet plus	58	2
Total Surface Area	2,854	100%

TABLE II. Water Chemistry, Chipewyan Lake. Sample 1 was taken at the surface and sample 2 at 20 feet.

Sample No.	1	2
Date	18-VII-69	18-VII-69
Depth (feet)	surface	20
Temperature (^{o}C)	22	22
Dissolved oxygen (ppm)	12	9
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil
Total alkalinity (ppm $CaCO_3$)	80	105
Calcium hardness (ppm $CaCO_3$)	65	65
Total hardness (ppm $CaCO_3$)	95	100
pH	8.8	8.4
Total dissolved solids (ppm)	180	180

TABLE III. Plankton sample, Chipewyan Lake, July 11, 1969.

Group	Relative Abundance*
A. Phytoplankton	
Chlorophyta	
Scenedesmus sp.	2
Spirogyra sp.	2
Staurastrum sp.	2
Ulothrix sp.	blm.
Chrysophyta	
Asterionella sp.	2
Fragilaria sp.	blm.
Stephanodiscus sp.	4
Cyanophyta	
Anabaena sp.	blm.
Microcystis sp.	tr.
Pyrrophyta	
Ceratium sp.	4
B. Zooplankton	
Arthropoda	
Cladocerans	3
Copepods	3
Rotifera	
Rotifers	2
Settled Volume of Sample (mls.)	1.1

* Relative Abundance Scale - trace, 1, 2, 3, 4, 5, bloom.

Total Vertical Haul (19')

TABLE IV. Bottom fauna analysis, Chipewyan Lake. A total of 21 - ¼ sq. ft. dredgings were taken on July 18, 1969. The following figures are standardized to square meters.

Organisms	No./m^2	% Total No.
Chironomidae	1,084	68.3
Amphipoda	293	18.5
Oligochaeta	154	9.7
Hirudinea	23	1.4
Pelecypoda	18	1.2
Gastropoda	14	0.9
TOTALS	1,586	100.0

TABLE V. Summarized catch record for Chipewyan Lake, July, 1969.

Date Set & Pulled	Set No.	Mesh Size	Set Length	Set Depth (ft.)	Lake Whitefish	Northern Pike	White Sucker	Cisco	Yellow Perch	Longnose Sucker	Total
16-17-VII-69	43	1½	50 yds	23	0	1	0	0	16	3	20
16-17-VII-69	43	3½	50 yds	23	2	6	0	30	0	0	38
16-17-VII-69	43	5½	50 yds	24	2	0	0	1	0	0	3
16-17-VII-69	44	2½	50 yds	24	0	6	0	4	14	0	24
16-17-VII-69	44	4½	50 yds	24	2	0	0	13	0	0	15
17-18-VII-69	45	5½	50 yds	20	4	0	0	0	0	0	4
17-18-VII-69	45	4½	50 yds	20	0	1	0	15	0	0	16
17-18-VII-69	45	2½	50 yds	20	0	7	0	9	12	0	28
18-19-VII-69	46	5½	50 yds	20	2	0	0	1	0	0	3
18-19-VII-69	47	3½	50 yds	8	0	25	1	6	3	0	35
19-19-VII-69	48	5½	50 yds	20	0	0	0	0	0	0	0
TOTALS					12	46	1	79	45	3	186

TABLE VI. Northern pike from Chipewyan Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	1	2.2	446	625	0.0
IV	11	24.4	512 (465-565)	917 (700-1110)	27.3
V	24	53.3	552 (464-629)	1180 (820-1540)	45.8
VI	9	20.0	589 (507-662)	1402 (920-2110)	55.6

TABLE VII. Lake whitefish from Chipewyan Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
VII	6	50.0	478 (436-505)	1910 (1420-2260)	33.3
VIII	4	33.3	497 (477-516)	2054 (1825-2650)	25.0
IX	2	16.7	514 (508-520)	2425 (2060-2790)	50.0

TABLE VIII. Cisco from Chipewyan Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
II	4	8.0	246 (234-253)	205 (190-220)	75.0
III	3	6.0	284 (257-300)	325 (235-380)	33.3
IV	8	16.0	344 (293-392)	606 (340-800)	37.5
V	15	30.0	362 (335-397)	702 (540-975)	53.3
VI	18	36.0	369 (336-408)	728 (610-890)	66.7
VII	2	4.0	404 (403-404)	800 (740-860)	50.0

TABLE IX. Yellow perch from Chipewyan Lake, July, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
IV	1	10.0	218	120	100
V	5	50.0	203 (193-215)	118 (110-130)	100
VI	2	20.0	219 (210-228)	140 (120-160)	100
VII	1	10.0	257	240	100
VIII	1	10.0	254	230	100

TABLE X. Commercial fishing record, Chipewyan Lake.

Year	Lic.	Mixed	Pike	Whitefish	Total
52/53	1			3,369	3,369
53/54					
54/55					
55/56	1			1,200	1,200
56/57	2			2,100	2,100
57/58					
58/59	4	2,122	372	49,967	52,461
59/60	4			31,600	31,600
60/61					
61/62					
62/63	2			150	150

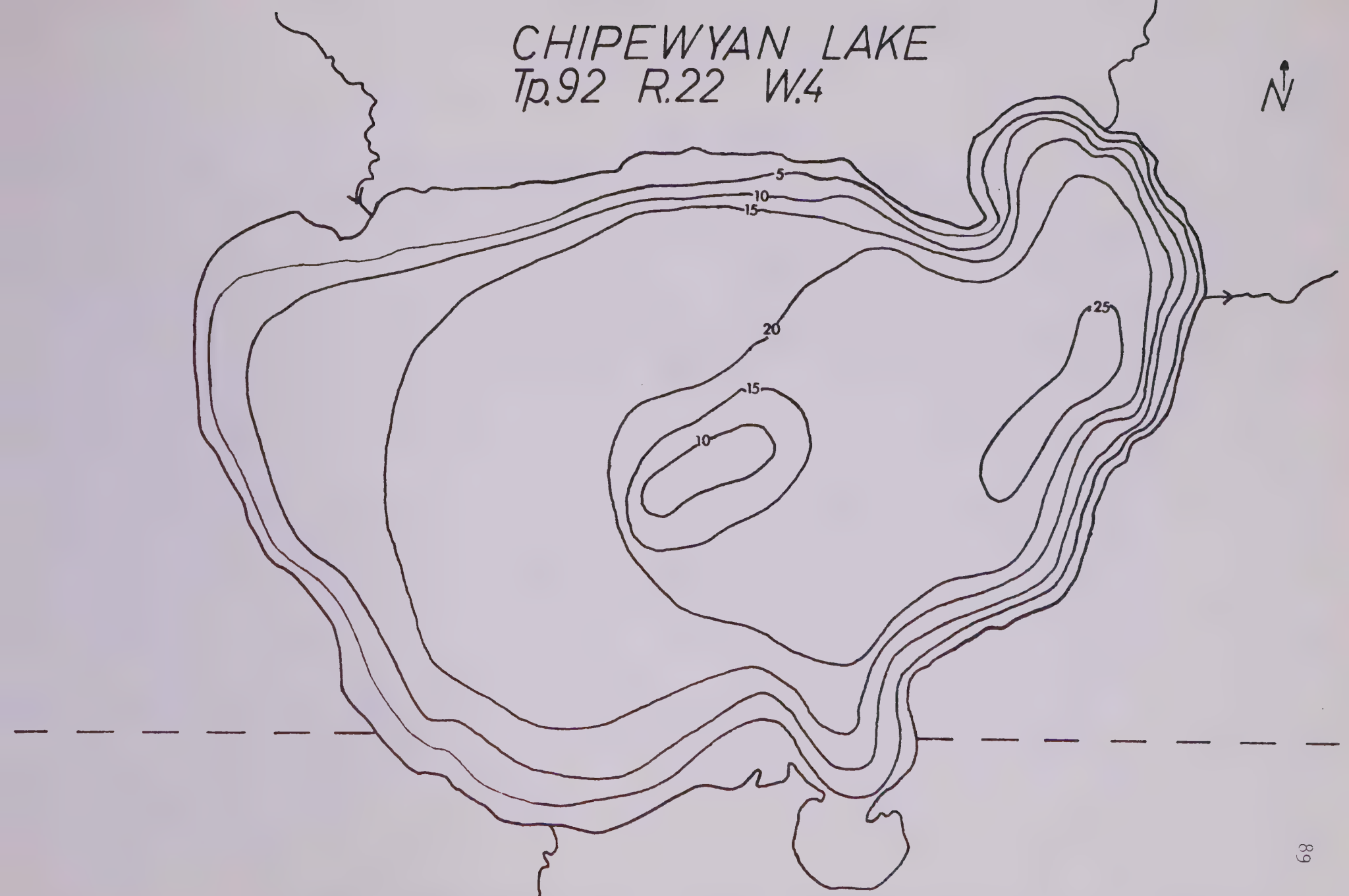


Figure 1. Bottom contours of Chipewyan Lake.

Figure 2. Dredging sites and net set locations of Chipewyan Lake.

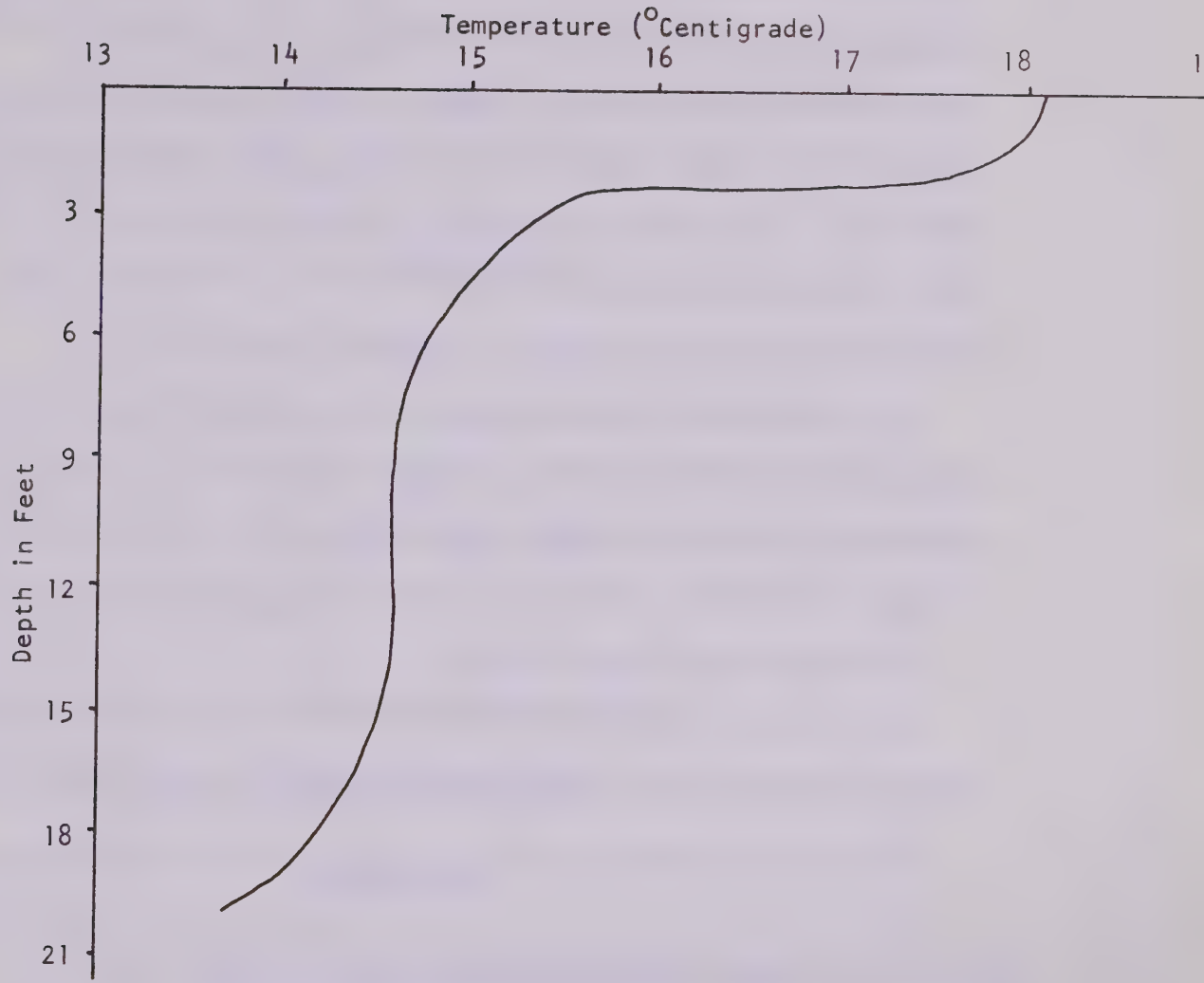


Figure 3. Thermal profile of Chipewyan Lake, July 18, 1969.

BURNT LAKE

The Burnt Lakes are a group of five lakes located in Townships 95 and 96, Ranges 24 and 25, west of the fourth meridian. The largest most northerly lake (latitude 57° 17' N, longitude 113° 57' W) was surveyed from 30 July to 3 August, 1969 to assess its fishery potential (Fig. A). The elevation of the lake is approximately 2,300 feet m.s.l. The lake has one inlet, originating from one of the smaller Burnt Lakes, and one outlet which drains into the Wabasca River. This area is inaccessible except by floatplane in the summer.

Burnt Lake is located on a high plateau which rises abruptly from the surrounding muskeg. The terrain consists of high rolling hills covered with pine and poplar interspersed with patches of muskeg where spruce is dominant. These hills completely surround the lake and have a limiting effect on wind action.

There is no record of commercial fishing on this lake. The second largest lake of the group does support a good commercial fishery.

Morphometry

The surface area of Burnt Lake is 2.37 square miles and the shoreline length is 6.6 miles giving a shoreline development factor of 1.21. This means that the lake has a regular shoreline. The maximum effective length is 2.27 miles in a northwest-southeast direction, parallel to the prevailing summer winds. The maximum effective width is 1.50 miles.

Depths were taken with a Furuno echo sounder and the results were used to plot a bottom contour map (Fig. 1). The calculated lake volume is 56,106 acre feet. The maximum depth is 81 feet with a mean

depth of 37 feet. From the depth distribution (Table 1) it can be seen that under one quarter of the lake is less than 15 feet in depth. The shoreline is made up of either sand and rubble or large areas of marshy vegetation.

Large areas of emergent and submergent vegetation occurred along the southern and western shores and were most abundant in the areas surrounding the mouths of the inlet and outlet.

Inflow-Outflow

Both the inlet and outlet appear to have no fishery potential. Neither exhibits a measurable current velocity. Channel braiding occurs a very short distance downstream from the lake on the outlet and it appears to have a highly variable discharge. The discharge was low at the time of the survey.

Physical and Chemical Data

Two samples were collected at the limnology station, one at the surface and one at 72 feet. The air temperature was 12°C and it was clear and calm.

Water temperatures were recorded every 5 feet, these varied from 16°C at the surface to 5.5°C at 72 feet. As indicated by the thermal profile (Fig. 3) stratification had occurred and a somewhat unusual thermocline existed between 20 and 50 feet. This may have been caused by 2 to 3 weeks of very hot weather which raised the temperature of the top 20 feet to 16°C. There was little or no wind action during this time and consequently little or no mixing occurred. The Secchi disc reading was 7.5 feet. The concentration of dissolved

oxygen at the surface was 9 ppm and 3 ppm at the bottom. The pH was 7.7 at the surface and 7.2 at 72 feet. Additional water samples are shown in Table II.

Plankton

Two total vertical plankton hauls, one from a depth of 30 feet and the second from 72 feet were taken. The most common phytoplankters were Asterionella, Fragilaria, and Tabellaria. Zooplankton included cladocerans, copepods, and rotifers but all were present in limited numbers (Table III).

Bottom fauna

Twenty bottom samples, each consisting of a single 6" x 6" Ekman dredging, were taken from the locations shown in Figure 2. These show a great diversity of bottom types; sand, gravel, clay, grey mud, black mud, and lake ochre (a ferric hydroxide precipitate). The standing crop of bottom fauna was calculated as 907 organisms per square meter. Chironomids were by far the most predominant group. The bottom fauna results are shown in Table IV.

Fish fauna

Six 12-hour net sets were made with a combined total of 750 yards of net being set in the survey (Table V). Species netted included lake whitefish (Coregonus clupeaformis), cisco (Coregonus artedii), northern pike (Esox lucius), longnose sucker (Catostomus catostomus), and burbot (Lota lota).

Lake whitefish

Fifty-five lake whitefish were netted and 45 were worked (Table VI). The fish taken were small with the largest weighing less than 1½ pounds. They are mature between 5 and 6 years of age. Thirty fish were examined for cysts of Triaenophorus crassus and 21 were found to be infected. In total 27.92 pounds of fish were found to contain 69 cysts giving an infestation rate of 247 cysts per 100 pounds of fish.

Cisco

Sixty one cisco were netted and 45 were worked (Table VII). These fish were small with the largest weighing just over half a pound. They mature at 3 years of age. Thirty were examined for cysts of Triaenophorus crassus and all but one was infected. In total 8.05 pounds of fish were found to contain 160 cysts, giving an infestation rate of 1,988 cysts per 100 pounds of fish.

Northern pike

Forty one pike were caught and worked (Table VIII). All were taken by angling in the shallow waters of the reed beds around the mouth of the inflowing creek. The fish varied in age from 4 to 9 years and all were mature.

Other species

Twenty-three longnose suckers and two burbot were taken in this survey. In January 1970 another 108 burbot were taken in 600 yards of 5½ inch net.

Discussion and Conclusions

Using the Ryder morpho-edaphic index, a productivity figure of 3 pounds of fish per acre per year can be postulated. This gives a figure of 4,500 pounds of fish per year on a sustained yield basis.

This low yield would indicate that the lake has very limited potential for a commercial fisheries. Only cisco and whitefish occur in any numbers and both have undesirably high infestation rates of Triaenophorus crassus which would also limit the potential.

Although the sports fishing potential of the lake is very limited, it may in the future, have possible values as a recreational area because of the sandy beaches, clean water and scenic terrain.

TABLE 1. Morphometry of Burnt Lake. (Soundings were taken with a Furuno echo sounder during July, 1969). Other data were taken from maps at a scale of three and one half inches to one mile.

LOCATION: Tps. 95 & 96, Rges. 24 & 25, W. 4; Tp. 96, Rge. 25, W. 4

AREA: 2.37 sq. mi. (1,517 acres)

VOLUME: 56,106 acre feet

SHORELINE: 6.60 miles

SHORELINE DEVELOPMENT FACTOR: 1.21

MAXIMUM LENGTH: 2.27 miles

MAXIMUM EFFECTIVE LENGTH: 2.27 miles

MAXIMUM WIDTH: 1.50 miles

MAXIMUM EFFECTIVE WIDTH: 1.50 miles

MEAN WIDTH: 1.04 miles

MAXIMUM DEPTH: 81 feet

MEAN DEPTH: 37 feet

DEPTH DISTRIBUTION:

Contour Interval	Acres	% Surface Area
0- 5 feet	141	9.3
5-15 feet	211	13.9
15-25 feet	193	12.7
25-35 feet	172	11.3
35-45 feet	179	11.8
45-55 feet	199	13.1
55-65 feet	198	13.1
65-75 feet	198	13.1
75-80 feet	20	1.3
80 feet plus	6	0.4
Total Surface Area	1,517	100.0

TABLE II. Water Chemistry, Burnt Lake. Sample 1 was taken at the surface and sample 2 at 72 feet.

Sample No.	1	2
Date	3-VIII-69	3-VIII-69
Depth (feet)	surface	72
Temperature (^{o}C)	11	11
Dissolved oxygen (ppm)	9	3
Phenolphthalein alkalinity (ppm $CaCO_3$)	nil	nil
Total alkalinity (ppm $CaCO_3$)	45	55
Calcium hardness (ppm $CaCO_3$)	40	40
Total hardness (ppm $CaCO_3$)	70	60
pH	7.7	7.2
Total dissolved solids (ppm)	88	92

TABLE III. Plankton sample, Burnt Lake, August 2, 1969.

Group	Relative Abundance*	
A. Phytoplankton	A	B
Chlorophyta		
Pediastrum sp.	tr.	tr.
Staurastrum sp.	2	3
Ulothrix sp.	3	3
Chrysophyta		
Asterionella sp.	4	4
Fragilaria sp.	3	4
Tabellaria sp.	4	4
Cyanophyta		
Anabaena sp.	2	2
Microcystis sp.	tr.	-
Nostoc sp.	2	1
Pyrrophyta		
Ceratium sp.	2	3

Settled Volume of Sample (mls.)

* Relative Abundance Scale: trace, 1, 2, 3, 4, 5, bloom.

Total Vertical Haul (30', 72')

TABLE IV. Bottom fauna analysis, Burnt Lake. A total of 20 - $\frac{1}{4}$ sq. ft. dredgings were taken on August 1, 1969. The following figures are standardized to square meters.

Organisms	No./m^2	% Total No.
Chironomidae	874	96.2
Trichoptera	4	0.5
Amphipoda	6	0.7
Oligochaeta	4	0.5
Hirudinea	13	1.4
Pelecypoda	6	0.7
TOTALS	907	100.0

TABLE V. Summarized catch record for Burnt Lake, July and August, 1969.

Date Set & Pulled	Set No.	Mesh Size	Set Length	Set Depth (ft.)	Lake Whitefish	Northern Pike	Cisco	Burbot	Longnose Sucker	Total
30-31-VII-69	51	2½	50 yds	70	0	0	13	0	0	13
30-31-VII-69	51	4½	50 yds	70	0	0	0	0	0	0
30-31-VII-69	52	1½	50 yds	73	0	0	18	0	0	18
30-31-VII-69	52	3½	50 yds	73	3	0	1	0	0	4
30-31-VII-69	52	5½	50 yds	73	0	0	1	0	0	1
30-2-VII-VIII-69	53	ANGLING			0	41	0	0	0	41
31-1-VII-VIII-69	54	1½	50 yds	21	1	0	0	0	14	15
31-1-VII-VIII-69	54	3½	50 yds	17	5	0	0	0	5	10
31-1-VII-VIII-69	54	5½	50 yds	12	0	0	0	0	0	0
31-1-VII-VIII-69	55	2½	50 yds	42	4	0	1	0	0	5
31-1-VII-VIII-69	55	4½	50 yds	53	0	0	1	1	0	2
1-2-VIII-69	56	2½	50 yds	20	17	0	1	0	0	18
1-2-VII-69	56	4½	50 yds	40	0	0	0	0	0	0
1-2-VII-69	57	1½	50 yds	42	0	0	24	0	0	24
1-2-VII-69	57	3½	50 yds	50	25	0	1	0	4	30
1-2-VII-69	57	5½	50 yds	59	0	0	0	1	0	1
TOTALS					55	41	61	2	23	182

TABLE VI. Lake whitefish from Burnt Lake, July and August, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
II	1	2.1	185	70	100
IV	4	9.0	273	238 (175-320)	75
V	17	37.8	320 (248-370)	382 (185-575)	52.9
VI	18	40.0	332 (304-370)	418 (325-525)	55.6
VII	4	9.0	344 (321-378)	480 (380-600)	50.0
VIII	1	2.1	358	525	0.0

TABLE VII. Cisco from Burnt Lake, July and August, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	20	44.4	207 (185-222)	102 (70-150)	60
IV	20	44.4	227 (204-275)	132 (95-250)	60
V	4	8.9	230 (205-254)	120 (85-180)	50
VI	1	2.2	256	190	100

TABLE VIII. Northern pike from Burnt Lake, July and August, 1969.

Age Class	Sample Size	% of Sample	$\bar{x}$ fork length (range) mm.	$\bar{x}$ weight (range) gms.	% Female
III	1	2.4	512	1000	100
IV	9	21.9	501 (444-569)	924 (610-1380)	66.7
V	12	29.5	617 (526-694)	1672 (965-2480)	91.8
VI	15	36.6	645 (602-778)	2035 (1035-3940)	80
VII	1	2.4	750	2600	100
VIII	2	4.9	897 (850-943)	5535 (4720-6350)	100
IX	1	2.4	894	5780	100

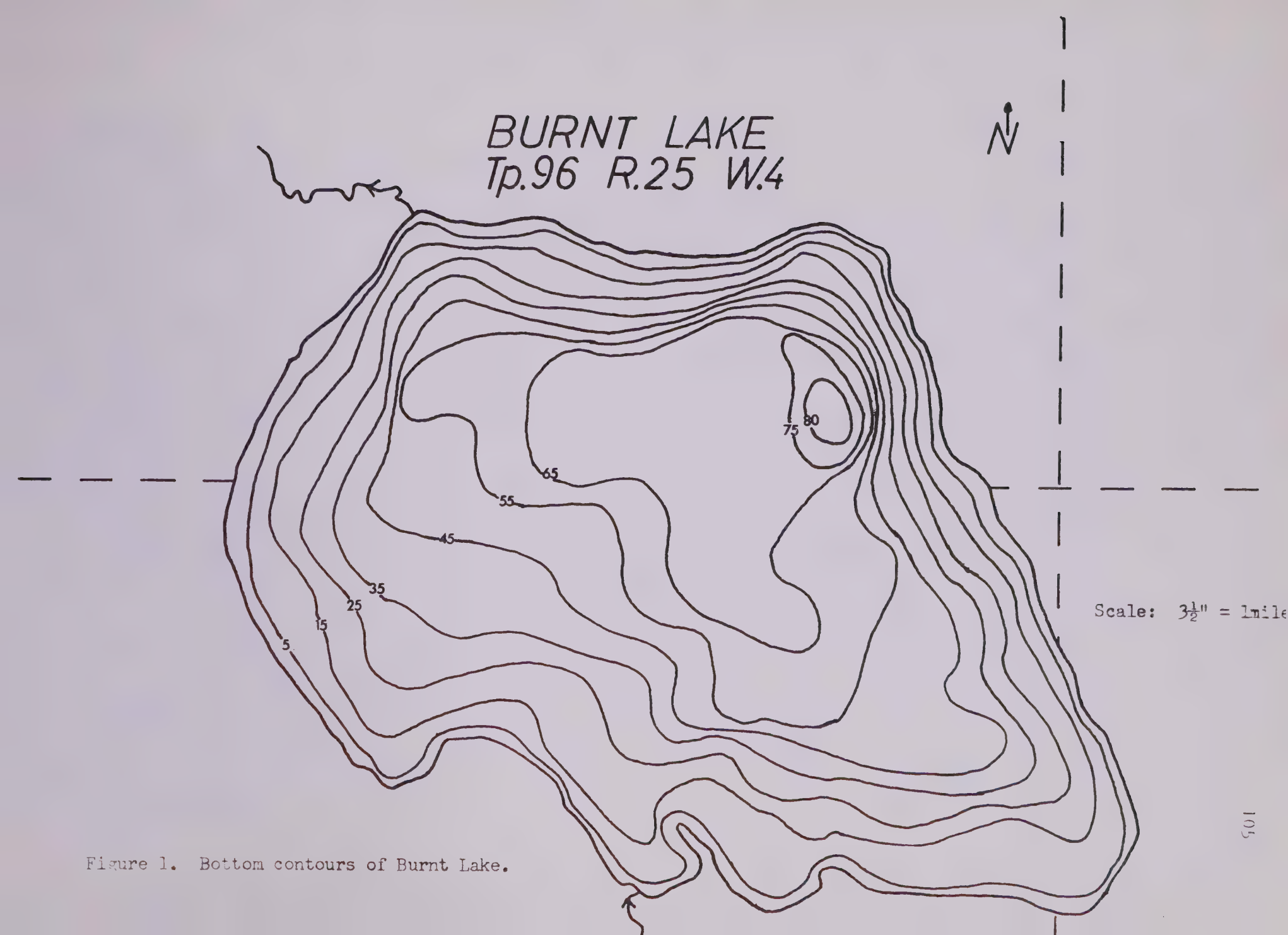


Figure 1. Bottom contours of Burnt Lake.

Figure 2. Dredging sites, net sets, and limnology stations of Burnt Lake.

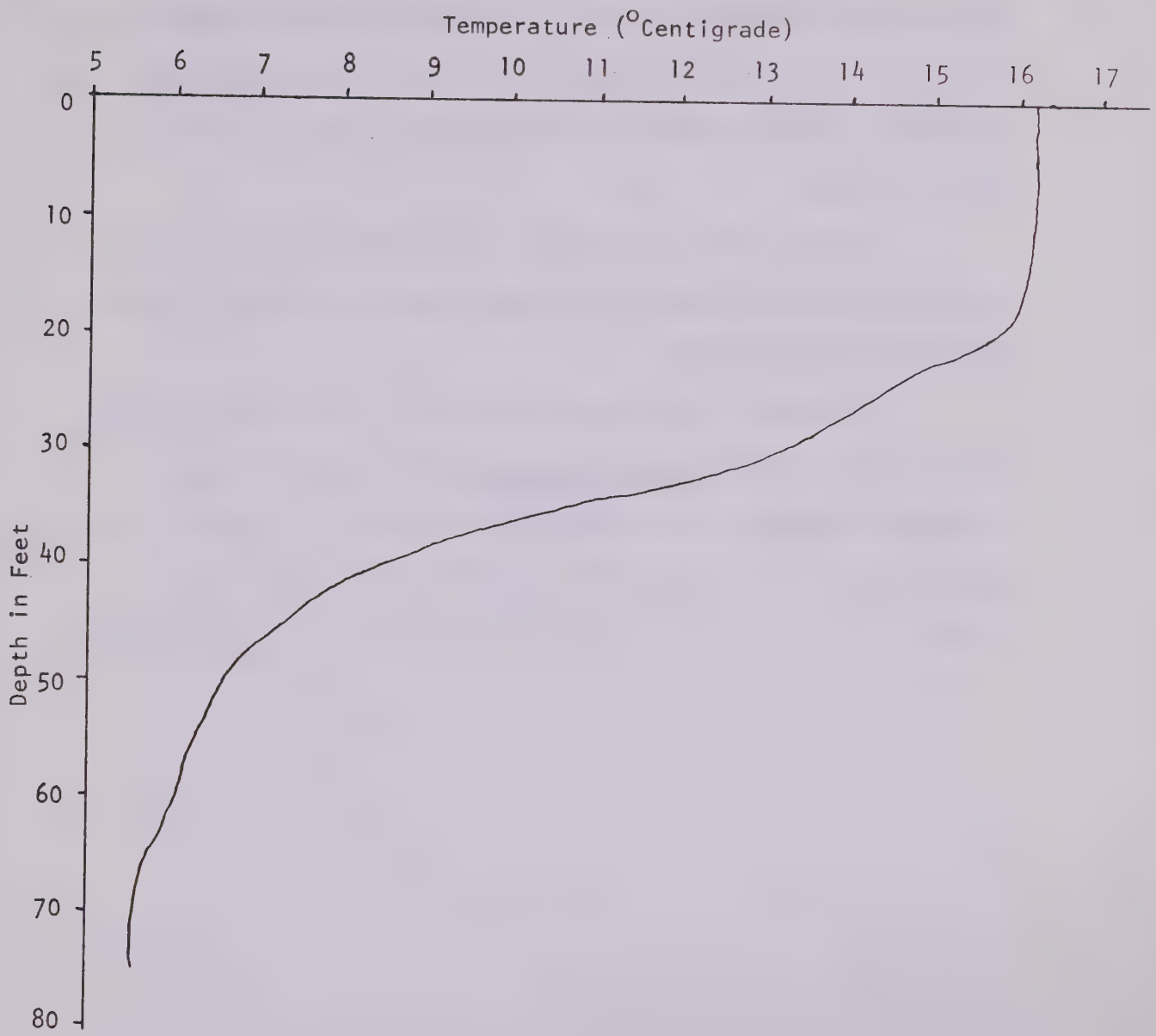


Figure 3. Thermal profile of Burnt Lake, August 2, 1969.

CONCLUSION

Of the six lakes surveyed during 1969 only Gregoire Lake has established recreational areas. In the future when the demand for more recreation areas increases, Christina and Gipsy Lakes have good potential. At the present time there are no plans to provide access to these lakes.

In the future the demand of the commercial and sports fishermen on these lakes will have to be weighed before a workable fisheries program can be determined.

The other three lakes mentioned in this report (Pearson, Chipewyan and Burnt) are poor both from the commercial and sports fisheries standpoint and should be left entirely as domestic fisheries lakes.

ACKNOWLEDGEMENTS

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APPENDIX

The following lakes were examined but did not merit a survey because of their size or shallow depths.

Algar - Tp. 84, Rge. 15, W. 4

Audet - Tp. 100, Rge. 3, W. 4

Maximum depth of 8 to 10 feet.

Behan - Tps. 72 & 73, Rges. 10 & 11, W. 4

Maximum depth found was 17 feet. It is commercially fished for pike and perch. It appeared to be fairly shallow from the air.

Birch - Tp. 85, Rge. 3, W. 4

This lake is commercially fished for cisco and pike.

Bohn - Tps. 79 & 80, Rges. 3 & 4, W. 4

Clyde - Tp. 73, Rge. 10, W. 4

The bottom was visible over much of the lake. The lake is open to commercial fishing for pike and perch, but there is no record of any fishing done.

Corn - Tp. 88, Rge. 25, W. 4

This is a small lake with a maximum depth of 23 feet. It has a small population of pike and whitefish, 5,829 pounds in all were taken in 1963/64.

Cowper - Tps. 79 & 80, Rges. 3 & 4, W. 4

The maximum depth found was 14 feet.

Formby - Tps. 83 & 84, Rge. 1, W. 4

Georges - Tps. 84, Rges. 5 & 6, W. 4

This is a small lake which has been commercially fished for pike and cisco.

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Goodwin - Tp. 74, Rges. 10 & 11, W. 4

This lake has been opened to commercial fishing for pike; no fishing has been done. The lake appears to be quite shallow.

Gordon - Tps. 86 & 87, Rges. 3 & 4, W. 4

This large lake is very shallow, being 3 to 6 feet in depth throughout.

Grew - Tp. 91, Rges. 20 & 21, W. 4

The maximum depth is 23 feet and the only fish present are very small perch.

Horseshoe - Tp. 83, Rge. 1, W. 4

The maximum depth found was 16 feet. Pike and perch occur in the lake.

Johnson - Tp. 100, Rge. 3, W. 4

Jumbo - Tp. 73, Rge. 4, W. 4

This is a very small lake which has been commercially fished for pike and whitefish.

Jean - Tp. 98, Rge. 24

Kearl - Tps. 95 & 96, Rge. 8, W. 4,

Marianna - The maximum depth found was 8 feet. A small population of pike occurs in the lake.

McClelland - Tps. 97 & 98, Rges. 8 & 9, W. 4

Mink - Tp. 91, Rge. 21, W. 4

The maximum depth found was 11 feet. Small perch are found in the lake.

Ronald - Tp. 103, Rges. 10 & 11, W. 4

The maximum depth found on the lake was 19 feet. Fire fighting

APPENDIX

operations prevented further investigation.

Shortt - Tp. 86, Rge. 2, W. 4

Teepee - Tps. 85 & 86, Rges. 24 & 25, W. 4

The maximum depth found was 15 feet.

Wappau - Tp. 75, Rges. 9 & 10, W. 4

This lake has been opened to commercial fishing for pike.

Watihusk - Tps. 82 & 83, Rges. 2 & 3, W. 4

Wian - Tps. 73 & 74, Rge. 9, W. 4

The bottom was visible over much of the lake. It was 2 to 6 feet deep.

APPENDIX

UNNAMED LAKES

AERIAL SURVEY - SUMMER 1969

84A

1. Location - Sec. 36, Tp. 90, Rge. 21. Sec. 6, Tp. 91, Rge. 20
   Shallow

2. Sec. 34 & 35, Tp. 90, Rge. 21
   Shallow

3. Sec. 5, 6, 7, & 8, Tp. 90, Rge. 21
   Shallow

4. Sec. 17 & 20, Tp. 89, Rge. 22
   Shallow

5. Sec. 25 & 36, Tp. 89, Rge. 21. Sec. 30 & 31, Tp. 19, Rge. 20
   Shallow

6. Sec. 33 & 34, Tp. 89, Rge. 21. Sec. 3 & 4, Tp. 90, Rge. 21
   Shallow

7. Sec. 10 & 15, Tp. 89, Rge. 21
   Shallow

8. Sec. 5, Tp. 89, Rge. 20
   Shallow

9. Sec. 23, Tp. 87, Rge. 20
   Shallow, large mud flats occur throughout the lake

10. Sec. 2 & 35, Tp. 87 & 88, Rge. 23
    Shallow

11. Sec. 28 & 33, Tp. 86, Rge. 22
    Shallow

12. Sec. 1, Tp. 85, Rge. 24
    Shallow

13. Sec. 18 & 19, Tp. 83, Rge. 20 & 21
    Shallow

14. Sec. 21 & 28, Tp. 83, Rge. 21
    Shallow

15. Tp. 91, Rge. 1, W. 5
    Shallow